The IRON AGE

JULY 28, 1949

$6090 losses for broken yokes

cut to $435

IN a single season at a steel company's unloading dock, the ore bridges broke 14 yokes on the bucket controls. New parts for each replacement cost $50. But far more serious was the 3½ hours' time lost in replacing each yoke—time charged for at the rate of $10 an hour, plus $100 an hour more for the boat delay. Investigation showed that improper lubrication was causing the trouble—a recurring expense of $435 per break, or a total of $6090 loss for one season.

Farval Centralized Lubricating Systems, installed on the six ore bridges, solved the lubrication problem. Since then only one yoke has been broken. Thus an annual loss from broken yokes has been reduced from $6090 to only $435. The first season's saving more than paid for Farval.

Farval is the original Dualine system of centralized lubrication that has proven itself in over 20 years of service. The Farval valve has only 2 moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its wide valve ports and full hydraulic operation, Farval delivers a measured charge of grease or oil to each bearing, with an indicator at every bearing to show that each valve has functioned.

For a full description, write for Bulletin No. 25. The Farval Corporation, 3252 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing.
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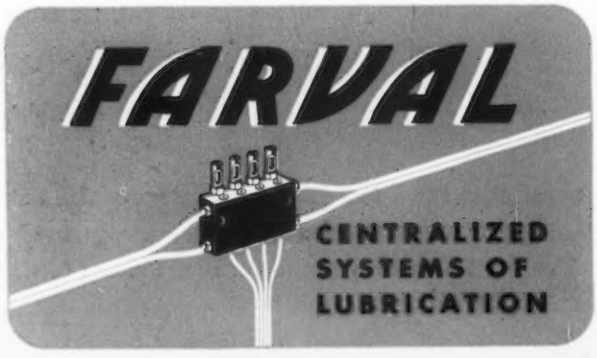

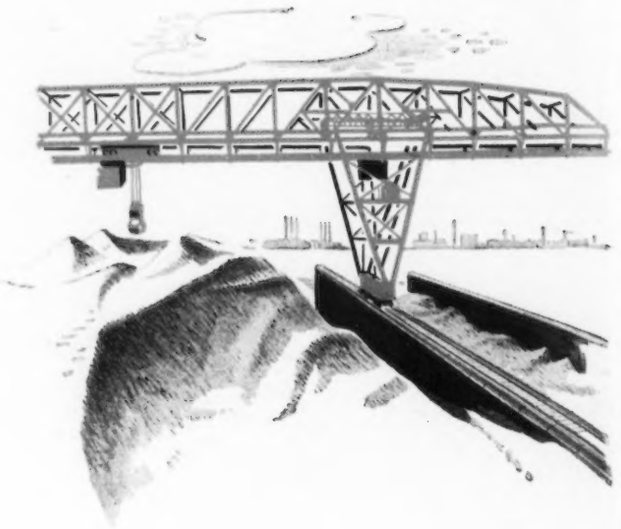

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The IRON AGE

Vol. 164, No. 4 July 28, 1949

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Features

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News and Markets

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FOR WORKABLE STAINLESS STEEL IT'S

Photos courtesy N
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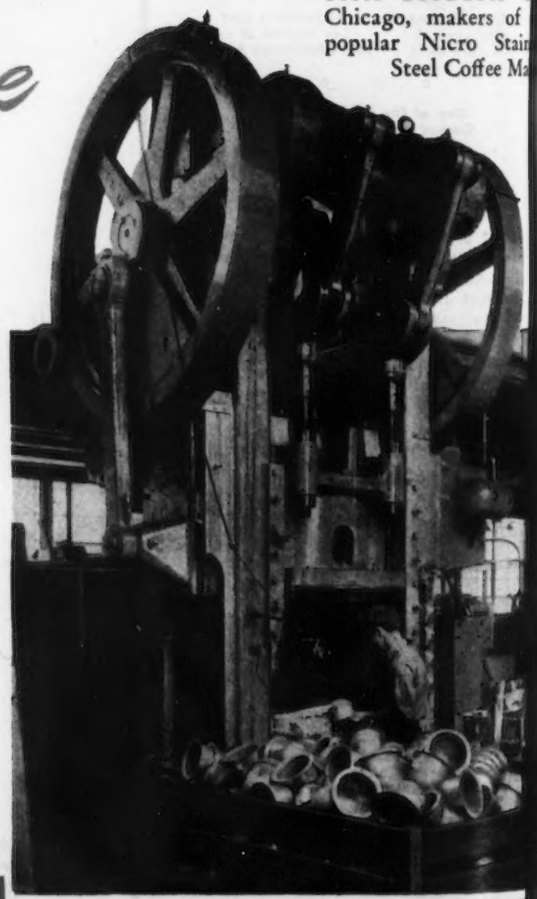
SHARONSTEEL *Every Time*



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Now Is The Time

NOW that the steel industry is submitting to Mr. Truman's three-man steel fact finding board—without obligation—a little plain talk is not out of order. If steel company people come to that board meeting without making it a sounding board for their ideas they will miss the boat.

They will be up against a man who knows what and how the public thinks. Philip Murray knows how to reach people. He takes a back seat to no one in getting his point across, whether it is right or wrong. It was not idle gossip when Cyrus Ching said unions are often better prepared at the bargaining table than industry.

Now is no time to make a long drawn-out technical or legal report on the steel side. True, there must be facts. But those facts have got to be dramatized. If they aren't, neither the board nor the public—through the working press—will be as interested as they should be. Nor will they know clearly just what the steel firms are fighting for.

It should be made plain just why steel companies think a fourth wage round would hurt the economy. Not only the economy, but the jobs of Joe and Mary. Unless Joe and Mary are in the picture they won't know how they are to be affected.

It should be made plain too why a non-contributory social security plan defeats itself in the long run. No one cares too much about something which costs him nothing. That point should be made as strong as possible.

Expanded pensions shouldn't be hard for the steel industry to talk about. They will affect steel prices and labor costs for years. All, or at least part, of pension payments have to come from the consumers of steel, not the makers. Consumers are in no mood for higher prices.

A new pension plan can not be set up without some thought about the future ability to keep it going. And that ability to keep it going on a sound basis must have contributions from those who get the pension. Without that it is a dole or paternalistic pap. The unions fought paternalism when they were battling their way to the top. Now they want to bring it back under another name.

If the three-man board hearings which start this week had been closed, then the approach by steel could have been different. But they are public. And one reason why steel firms went along with the President's proposal was because of the public angle.

Now it is up to steel to take its stand. That stand must be taken in simple everyday language. It must be dramatic. This board is not the Supreme Court. It is a panel of men who are not steel people but who must get the steel industry's slant if they are to grasp steel's position.

Later on if the board's recommendations are against steel, that is a different matter. The immediate need is for steel to follow up its capitulation to Mr. Truman with its own story—a story that tells those who can read why steel people turn down Philip Murray's demands.

Tom C. Campbell

Editor

Quick Steel

Keeps Harvester Production Moving

At 3:15 P.M. on April 11, International Harvester Company's Farmall Works at Rock Island, Illinois called the Ryerson Plant in Chicago. They wanted a thousand pounds of cold finished hexagons, 1⅜" x 10 to 12 feet. The bars were urgently needed for a brake pedal installed at an early stage of Farmall tractor assembly.

Marked "Rush" by the Ryerson service man who received it, the order was filled—the steel loaded and on its way at 5:05 P.M.—less than two hours later. Delivery was made in Rock Island—120 miles away at 9 A.M. sharp, the following morning.

This time-table graphically illustrates how fast and effectively Ryerson Steel Service swings into action when emergencies arise. With steel supply improving daily, our facilities for delivering all the steel you need exactly when you need it are better than ever. Just contact the nearest Ryerson plant for any steel requirement.

PRINCIPAL PRODUCTS

BARS—Carbon & alloy, hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Sheared & U. M., Inland 4-Way Floor Plate
SHEETS—Hot & cold rolled, many types and coatings
TUBING—Seamless & welded mechanical & boiler tubes
STAINLESS—Allegheny plates, sheets, shapes, bars, tubing, pipe fittings, etc.
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► Steel company economists, faced with the task of preparing a reply to the Nathan report on steel within a few days, are in a jam. They can rebut key points in the report which the former New Deal economist prepared for the United Steelworkers of America but to come up with a new one of the same scope in the time available appears impossible.

► Newest twist in ultrasonic testing is the technique in which the crystal is submerged in a liquid to minimize multiple reflections. Features include a reduction in surface smoothness requirements, ability to focus the sonic beam into fillets and complex surfaces and the possibility of using higher frequency crystals.

► Some consumers who stocked up with steel in expectation of strike are now in the middle. They can't decide whether to buy more as a hedge against serious labor trouble in September, to discontinue all purchases and slowly work off the excess stock or to sell it quickly and get back on the hand-to-mouth basis they were on before the strike threat.

► Engineers now trying to perfect descaling by quick heating of a scaled part report that to insure good results the part should be damp as it enters the heating device. The steam thus developed helps snap the scale from the piece.

► The inquiry for well over 25,000 tons of cold-rolled sheets that has been in the air for a month is apparently still there this week although one large company has reportedly booked a substantial tonnage. Short supply isn't the problem, as it would have been a year ago; the end-user wishes to remain anonymous.

► Railroads have practically stopped buying new cars but they are putting a lot of steam behind maintenance equipment with the idea of getting it in place before the Sept. 1 deadline when non-operating employees switch from a 48 to a 40-hr. week at the same pay.

► Initial experimental work indicates the possibility of employing radioactive tracers to get data on the velocity of gas passing through the blast furnace. British studies have been based on projecting radon gas through one of the tuyeres and simultaneous sampling of gas from the stockline. First results indicate much lower velocities than those reported in other types of tests.

► National Tube Co. will build a Consolidated type, large-diameter pipe mill in the Pittsburgh district. By obtaining plates from a local Carnegie-Illinois plant and shipping relatively short distances to nearby projects the new setup will mean substantial freight savings. The installation will be in one of U. S. Steel's existing plants.

► A party of Swedish geologists, prospectors and miners is planning to accompany a Danish government expedition to East Greenland. There they will study big deposits of lead ore and other minerals discovered in King Oscar Fiord last year. At one place, on the edge of the inland ice, large quantities of 84 pct lead were exposed to full view. It is estimated that at this site alone more than a million tons of lead could be mined.

► During 1948 the United States lost its leadership in the export of passenger cars to Great Britain. England exported 226,911 units into the world markets compared with 217,011 units for the U. S.

► The 1949 Canadian Mines Handbook reports that 52 Canadian mining companies are searching for uranium. The Geiger counter this year is out-clicking the diamond drill as a prospecting instrument. More companies are prospecting for the elusive radioactive element than are diamond drilling for gold.

► Production of square-section concrete reinforcing bars will soon be stopped. The American Iron & Steel Institute plans to petition the Simplified Practice Div., U. S. Bureau of Standards, to adopt rounds rolled to the new high bond deformations. Producers, who will be polled by the Bureau, indicate they'll go along, and most fabricators and government agencies favor the change.

► A number of companies are bidding on 57 mm, 75 mm and 20 mm gun contracts under the rearmament program. Some contracts have been awarded to a few eastern firms. The Air Forces' 20 mm contract will probably be the biggest of the three.

Machining Diesel Engine

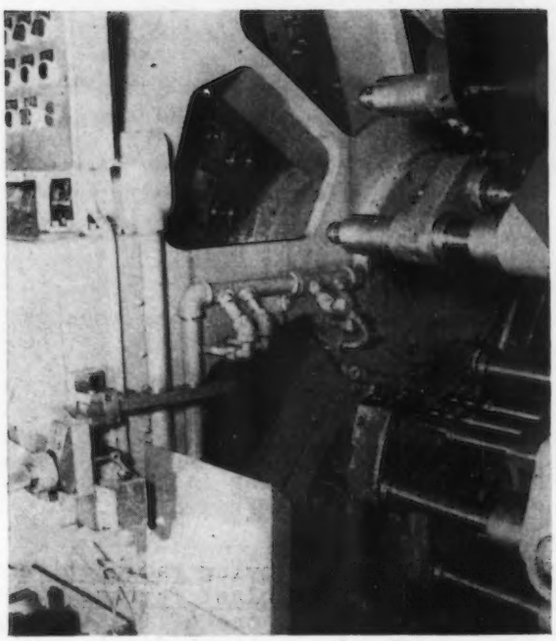

FIG. 1—In this 20-station, two-way, horizontal Greenlee drilling machine, distributor valve blocks are drilled, reamed and tapped from two directions.

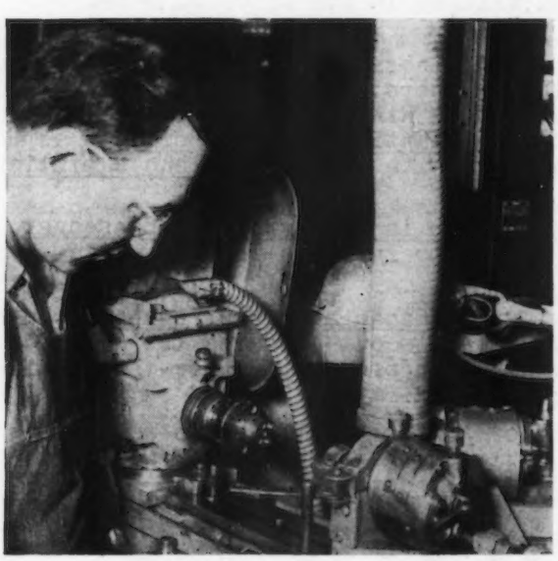

FIG. 2—The valve hole and valve seat are ground in this setup. The hole is ground with one grinding wheel and the 45° angle by a second grinding head.

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BY JOHN LINN

General Foreman, Injection Pump Div., International Harvester Co., Milwaukee

o o o

FUEL injection pumps for diesel engines require exacting machine work for the unusually close fits necessary. Extremely high pressures are developed by the pump, yet the fuel must be metered in minute quantities. The manufacturing methods developed at International Harvester Co., Milwaukee works, hold to the close tolerances necessary, and satisfy a production demand that is well within the meaning of mass production.

Because of the nature of the fuel injection pump, its entire manufacture is an excellent example of precision production. Some of the operations relating to metering and distributing units are unusual because of the manufacturing and gaging methods employed. Many of the components are made of steel and heat treated before machining not only to insure required hardness but to avoid dimensional changes in the steel part after it is put in service. In most products, such changes in dimension would be inconsequential, but in the fuel injection pump such conditions are intolerable.

The distributor valve block is a prime example of exacting machining methods. This part is a heat treated steel block machined to encase the valves along the bottom, a high pressure line terminal on one side and discharge fitting terminals along the top. The first machining operation on the part consists of drilling an oil passage hole through the entire length of the block. The hole is drilled halfway through from one side and halfway through from the other by a Delta drill using a duplicate set of hand loaded indexing fixtures. The drills are fed automatically by air operated feeds. Two faces of the block are then ground

Fuel Pump Parts

Extreme precision is necessary in machining fuel injection pumps for diesel engines because of the high pressures developed by the pump and the accuracy required in metering fuel into the engines. Some of the more outstanding machining and grinding operations on a few of the pump components are described, emphasizing the close tolerances and gaging methods.

at right angles to each other on a Blanchard surface grinder, and locating holes are drilled.

Loaded into the Greenlee horizontal, double-end multiple drilling machine shown in fig. 1, the discharge fitting holes, valve holes, and other necessary holes through the top and bottom faces are drilled, reamed and tapped. The machine has one loading and 10 work stations, automatically performing all hole operations once the work is loaded and clamped. All holes from the top and bottom faces are produced in this machine and the taps are controlled by lead screws.

Another part that is machined to close tolerances is the reverse check block. In grinding a $\frac{1}{8}$ in. diam hole, $\frac{3}{8}$ in. deep, the setup on a Rivett grinder shown in fig. 2 is employed. Before grinding, the hole runout of the drilled piece is checked with a dial indicator to make certain it does not exceed 0.0005 in. total runout. The ground diameter is held within 0.1250 and 0.1253 in. limits, this being checked with the Sheffield Precisionaire gage mounted behind the machine.

After the hole is ground to size, a 45° seat is ground at the outer end using the same setup to make certain that the seat is concentric with the bore. The seat is ground on a 220 grit wheel fed in on a separate head which is set at the required angle. Both the hole and seat grinding wheels are air driven and have a spindle speed of 30,000 rpm.

The plungers are finish ground on the Norton grinder setup shown in fig. 3, using a wheel 20 in. diam, with a face width of $2\frac{3}{4}$ in.; and the work is rotated on female centers. The large

FIG. 3—Final grinding of plungers with a slight taper to a finish of 2 to 3 rms is done on this Norton grinder.

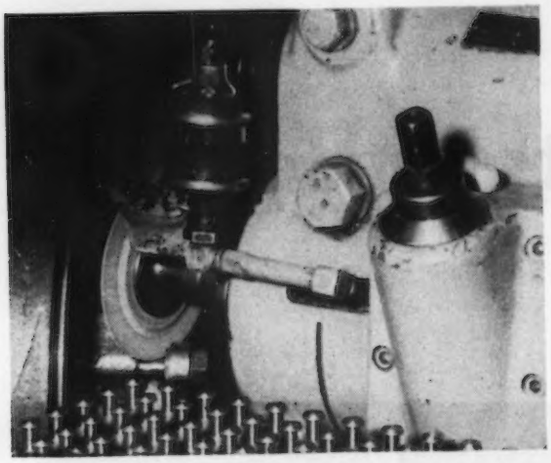

FIG. 4—Using a U. S. Multi-Miller for this grinding setup, the helix on the plunger is ground. A master helix controls the position of the plunger as the part is rocked in contact with the face of the wheel.

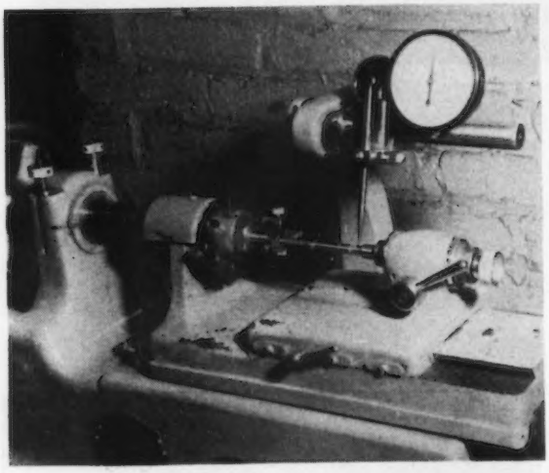

FIG. 5—The lead of the helix on the plungers is checked by this dial gage setup, in which the point at one of the levers follows the helix as the plunger is turned by a hand wheel.

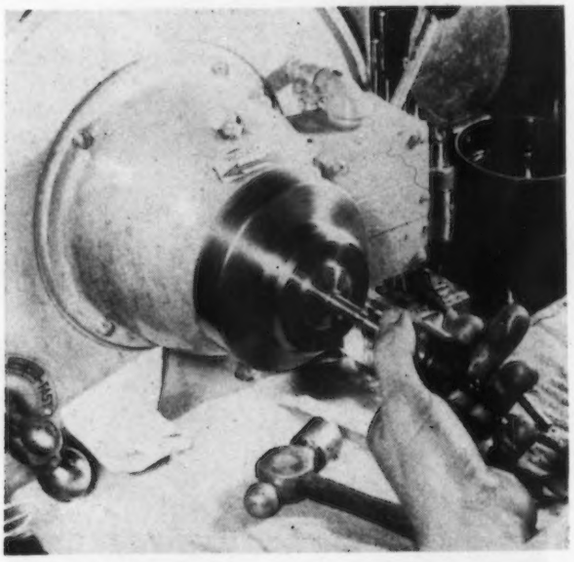

FIG. 6—Plungers are lapped into their bushings selected for them. The plunger is chucked and the bushing held by hand during lapping in. A 700 grit abrasive is used.

end of the plunger is held to 0.3751 in. diam, and a 0.000025 in. taper is required at the small end. Finish specified is 2 to 3 rms. To attain this finish, the grinding wheel is lightly scored with a diamond across the face and parallel to the wheel axis at about ¼ in. intervals. Dimensional gaging is done with a Pratt & Whitney Electrolimit gage mounted near the operator.

A helix is formed in the upper end of the plunger. Because the amount of fuel delivered to the engine is determined by the position of this helix in relation to the port hole in the plunger bushing, this is one of the most critical parts. The flat face of a thin wheel, set at the proper helix angle, is used to grind this helix. A U. S. Multi-Miller, as shown in fig. 4, is used as a grinding machine.

The plunger is held in a chuck that rocks and, in so doing, follows a master helix as grinding proceeds. The wheel position, set at the required helix angle, is fixed. A micrometer, equipped with a microscope, is used to check the length of the line at the end of the helix, and the helix itself is checked on a large dial gage, shown in fig. 5. In checking the helix, the plunger is rotated by a hand wheel and the point at the end of a pivoted indicator arm follows the helix, indicating on the dial whether or not the lead is within limits set.

Among the several lapping operations is that done on the hole in the fuel injection pump nozzle plates. The hole is held within 0.0340 and 0.0350 in. diam, and lapping is done by a slightly tapered wire mounted on a Schauer lapping head that rotates at about 350 rpm. A 700 grit lapping compound is used with the wire. Several plates are lapped simultaneously, but each is checked with a tapered plug gage made of piano wire. This wire is marked to show the limiting position within which a plate will position if the hole is of correct diameter.

After grinding the plungers, as shown in fig. 3, these parts are lapped before being fitted in the bushing in which they are assembled. Plunger diameter is decreased 0.0001 in. in this lapping. Five points on the diameter of the plunger are checked by Precisionaire gages. The diameter that fits the mating bushing must be not less than 0.000025 in. or more than 0.00006 in. smaller than the bushing bore diameter.

The bushing bores, after final grinding, are honed while the bushing floats in a fixture. The bore is checked by a Precisionaire gage. The bores are held straight and round to +0.000015 in. and are selectively fitted to their respective plungers. The selected plungers and bushings are then lapped in as the plunger is turned in a chuck at 500 rpm while the bushing is held by hand, as shown in fig. 6. The lapped pair is then placed in a fixture where the fit is checked by applying oil of a viscosity of 45 sec at 100°F at a pressure of 2500 psi.

Leakage rate of the oil between the bushing and the plunger is a measure of the fit obtained. Specifications require that this leakage, measured in a precision graduate, must be not less than ½ cc nor more than 1½ cc per min. A

pump operated by a hand lever is used with this fixture to build up the required pressure and a clock with a sweep hand checks the time that full pressure is applied.

Several critical parts of pump assemblies require flat surfaces that must be lapped to insure the fits specified. Much of this lapping is done on Norton surface lappers equipped with holders accommodating several parts, each of which is given an eccentric motion against the cast iron lap. The abrasive used is levigated alumina of 700 grit. Optical flats are used in checking the lapped surfaces.

Certain subassemblies built up from parts that include those described are given pressure and operating tests before being incorporated into final assemblies. One of these tests is made on the distributor valve blocks. In this test, a hand operated hydraulic pump applies a pressure of 4000 psi, and if any leakage occurs at the hole in the face of the block at this pressure, the assembly is rejected.

Tubing Produced by Welding Coiled Strip

A METHOD for producing stainless steel tubing, including Monel and Inconel, by mechanized inert gas shielded arcwelding of spiral coiled strip has been developed by B & M Mfg. Co., Grand Rapids. Fig. 1 shows the setup used to produce this tubing.

The edges of the strip are squared by leading against Carboloy tools as the strip is pushed to the coiling tools. The correct amount of pressure can be applied to the melted edges of the strip by precise control of the angle of coiling. Control of the angle of coiling is also used to offset any variation in the strip width.

An exact width of strip for each tubing OD is not needed in this method. For instance, a 3 in. strip may be coiled into tubing from 1½ to 6 in. OD. Sizes may be changed on the spiral welding machine in a matter of minutes.

Due to the exact control of the strip edges at the point of welding it is said that much thinner wall sections may be welded, particularly in the larger diameter tubes. Tubes with 1 in. OD x 0.010 in. wall, in type 304 stainless, have been made on a production basis.

Spiral coiling works the material to a lesser degree than conventional straight seam forming and hence spirally welded stainless tubing may be cold worked to a greater extent without an annealing operation. It is standard practice to take a 40 pct reduction in area, by cold drawing, on tubing direct from the spiral welder. Tubing of ½ in. OD can be held to a total of 0.001 in. tolerance on the OD and 3 in. OD tubing to a total of 0.002 in. on the OD.

As spirally welded tubing is straight as it comes from the welding machine, no straightening operation is necessary for further work such as bending, cold drawing, etc. The tubing is credited with having a homogeneous structure, since filler rod is not used in welding. There is no evidence of a seam after cold drawing.

Stainless tubing produced by this method is available in the as-welded condition in cold drawn full finished and OD polished ornamental grade in sizes up to 6 in. OD. Perforated tubing is also being produced.

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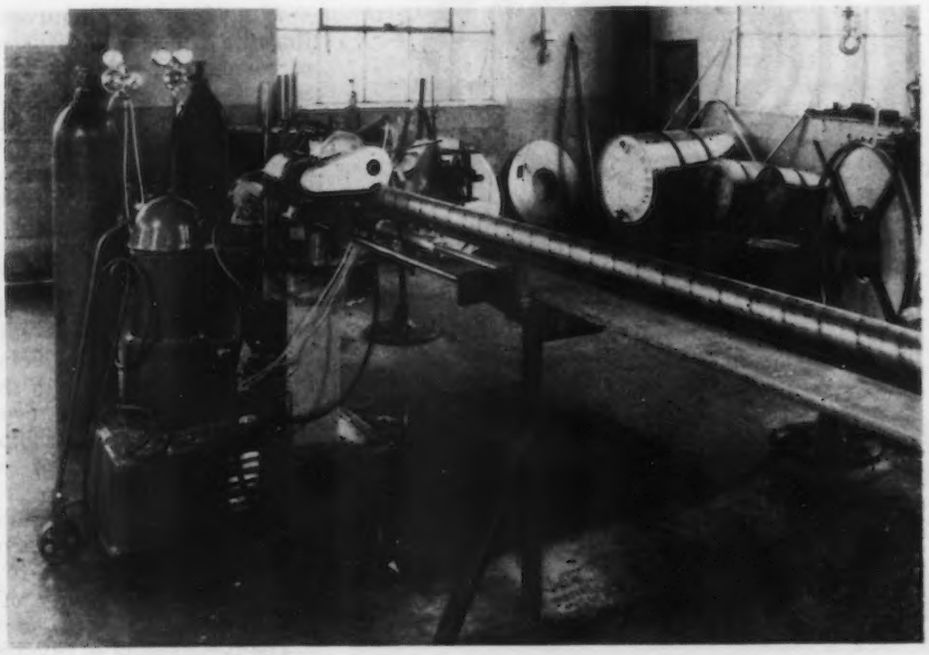

FIG. 1—View of one of the units where spiral coiled strip is welded with the inert gas shielded arc technique to produce stainless tubing.

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TITANIUM

. . . its prospects

. . . its properties

BY R. I. JAFFEE

and

I. E. CAMPBELL

Assistant Supervisors in Nonferrous Metallurgy,
Battelle Memorial Institute,
Columbus, Ohio

TITANIUM research conducted by the Remington Arms Co., Inc., Bridgeport, Conn., has resulted in successful fabrication of tubing, wire and cold formed sheet products. At *A* are shown welded and seamless tubes; wire sizes ranging from 0.006 to 0.120 in diam. are shown at *B*, while C illustrates a spun cup, a stamped disk and 0.0003-in. foil produced from titanium sheet.

With the first flush of excitement, certainly marked by excessive optimism, giving way to practical research and development, titanium metal is now entering a new and, from an engineering viewpoint, a more interesting phase. A critical, earthy appraisal of the prospects and properties of titanium and its alloys is given in this article. Metallurgical concepts in alloying and in the application of the material for high temperature service are also explored.

TITANIUM is an exception to the saying, "good things come in small packages." High-grade titanium ores are widely distributed, and although titanium has until recently been a "rare metal," in the combined form it is far from rare, being exceeded in abundance by only three of the structural metals, i.e., iron, aluminum, and magnesium.

A number of titanium ores are known, but only ilmenite (largely $FeTiO_3$) and rutile (TiO_2) are of commercial importance. Of the two, ilmenite is by far the more plentiful and should be considered the most important source of metal for the metallurgical industry.

Before the war, domestic production of titanium ores was very limited, the chief source of supply being the vast beach sands of Travancore, India. Approximately one-quarter of a million tons of concentrates were imported from this area in 1939. As overseas supplies were first decreased and then finally cut off during the war, however, domestic production was dramatically increased, particularly in the Adirondack region of New York. In 1947, over one-third of a million tons of ilmenite, containing approximately 160,000 ton of titanium oxide, were produced, chiefly for the pigment industry. With the debut of titanium as a structural metal a probable event of the near future, continued increases in domestic production are to be expected despite the renewed availability of foreign sources of supply.

The preparation of ductile titanium by a com-

mercially feasible process presents a formidable problem that has attracted an increasing number of investigators during the past 50 years. Relatively small amounts of oxygen and nitrogen are sufficient to render the metal quite brittle, and both are absorbed irreversibly at elevated temperatures. This ability of titanium to pick up oxygen and nitrogen at low pressure makes it useful as a "getter," but is a thorn in the side of the process metallurgist. All attempts to remove oxygen and nitrogen from metallic titanium have, to date been unsuccessful, and to obtain ductile titanium it has been necessary to avoid excessive contamination with these gases, both in preparing and processing the metal.

As early as 1910 reports were made of the preparation of small buttons of ductile titanium by sodium reduction of the tetrachloride but no method was known at that time for obtaining larger specimens. About 15 years later, de Boer and coworkers prepared the first massive samples of ductile titanium by their now classical iodide process, i. e., by thermal decomposition of volatile titanium iodides on a heated filament.

The real impetus to titanium research, however, was the announcement by the Bureau of Mines that a product amenable to powder metallurgy techniques could be prepared by magnesium reduction of titanium tetrachloride. As initially announced, the process consisted of the preparation of titanium powder by grinding the product obtained by reacting liquid magnesium with titanium tetrachloride vapor and then compacting and sintering the powder by vacuum powder metallurgy techniques.

The major research effort on the preparation of ductile titanium has been directed towards expansion and improvement of the initial Bureau of Mines process which was in turn a modification of the Kroll process.[1] The most significant departure from this process to date has been the use of arc melting in place of the more restrictive powder metallurgy processes. Marked increases have been made in equipment capacity both at the bureau and elsewhere, and it seems safe to say that the magnesium reduction of the tetrachloride will remain, as a commercial method for the production of titanium.

The future of other methods is not so clear. Undaunted by failure of earlier workers who lacked many techniques available today, research investigators are considering other methods of preparing titanium—the primary goal being a low-cost continuous process more suitable to tonnage production.

A crude product (96 to 98 pct) containing varying quantities of oxygen, carbon, iron, and calcium has been produced commercially by calcium or calcium hydride reduction of the oxide, but this material is quite brittle and is of use chiefly as an alloying agent or as a raw material for the iodide process.

For many years following the preparation of ductile titanium by the iodide process, ductile titanium and iodide-titanium were synonymous The marked success of the Bureau of Mines process has changed this, and today both processes produce truly ductile titanium. Many workers, however, still consider the high-purity iodide material the best base for fundamental alloying

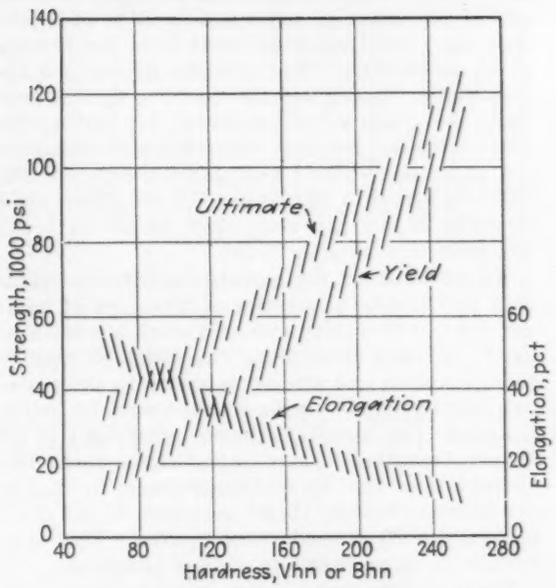

FIG. 1 — Approximate tensile - hardness correlation for titanium.

investigations. Several research laboratories have produced small quantities of iodide-titanium for this purpose, and the Foote Mineral Co. of Philadelphia, producer of iodide-zirconium, has produced small quantities of iodide-titanium from time to time, but there is no available commercial source of the iodide-refined product at this time.

Although there is no technical reason why the iodide process could not be expanded to tonnage production, the commercial feasibility of such a process has been severely questioned. In any event, considerable research and development would be entailed to bring the iodide process to a commercial scale, and present plans of the newly born titanium industry are tied to one or more modifications of the Bureau of Mines process.

What was there about the original Bureau of Mines data on the properties of titanium that aroused so much interest and activity?

It is worthwhile to re-examine these data from this point of view. The metal produced had a hardness of 200 to 225 Bhn, an ultimate tensile strength of some 80,000 psi, a yield strength of about 65,000 psi, an elongation of 25 pct in 2 in., and a fairly good modulus of about 16 million psi. It could be cold rolled 40 to 50 pct reduction in thickness to an ultimate of about 125,000 psi, a yield of about 115,000 psi, and an elongation of 8 pct in 2 in. In addition, the metal was relatively light, density 4.5, and had corrosion resistance comparable to stainless steel.

It should be pointed out, and it is of course recognized by all those working with the metal, that the properties of the Bureau of Mines titanium are not those of the base metal, but are those of an alloy of titanium, whose most important alloying constituents are a few tenths per cent of oxygen and nitrogen. Closer to the titanium base line is iodide titanium, which has been made and described by Gonser and coworkers at Battelle Memorial Institute. The properties of

their metal, whose oxygen and nitrogen contents are on the order of a few thousandths of a percent, are considerably different from the Bureau of Mines product. The strength figures are approximately halved and the ductility figures doubled. A typical set of properties for iodide titanium after arc melting, fabricating, and annealing might be: Vickers hardness (or brinell) 100, ultimate strength 45,000 psi, 0.2 pct offset yield strength 25,000 psi, elongation 40 pct in 1 in., and reduction of area 75 pct.

An estimate of the correlation between hardness and tensile properties of titanium of various degrees of purity and cold work is shown in fig. 1. These curves show the order of magnitudes involved and are not intended to show precise relationships. In the Battelle work on iodide titanium[2] the lowest hardness mentioned is 60 Vhn. According to the correlation curves the properties of 60 Vhn titanium should be 35,000 psi ultimate tensile, 15,000 psi yield, 55 pct elongation, and 80 pct reduction in area. This may well be the true base line of pure titanium.

Further differences between the iodide and magnesium-reduced titanium show up in their respective cold working characteristics. Iodide titanium can be straight rolled to as much as 99 pct reduction in area without cracking or overworking. The limit for magnesium-reduced titanium is some 50 to 70 pct reduction in area by cold working. Both materials end up at about the same hardness, 250 to 275 Vhn. They actually have similar work-hardening characteristics, the iodide titanium, being softer originally can be cold worked at the same hardening rate to a greater reduction, and thus end up at the same hardness level.

The appreciably lower strength level of the titanium base line does not appear to discourage optimism. It then is argued that if a few "whiskers" of oxygen and nitrogen can double the strength of titanium, who knows what further improvement can be attained by further alloying?

High-Temperature Properties

The melting point of titanium is extremely high for so light a metal, being some 3150°F. This has prompted some speculation about titanium-base alloys for high-temperature service. It is extremely unlikely that this will come about, because at temperatures above red heat titanium starts absorbing oxygen and nitrogen irreversibly from the atmosphere, and eventually becomes so embrittled as to be worthless. Alloying conceivably could overcome the excessive reactivity of titanium by modifications of the scale-forming characteristics. This will be difficult, because of the large solid solubility and relatively rapid diffusion of oxygen and nitrogen in titanium.

The reactivity of titanium at elevated temperatures is so great that the Bureau of Mines was forced to process pressed and vacuum sintered powder by cold working and vacuum annealing or by enclosing the vacuum-sintered ingot in an iron sheath and hot rolling, thus excluding it from access of the atmosphere.

Ingots which have been melted and cast are not nearly so susceptible to contamination by fabrication at elevated temperatures. Thus, the statement is made[3] that ingots may be readily forged in air within the temperature range 1600° to 1800°F. This operation could not even be considered with ingots produced by powder metallurgy techniques. Despite the improved tolerance of melted ingots at elevated temperatures, it is desirable to conduct the hot working operations rapidly so as not to pick up excessive amounts of oxygen and nitrogen from the atmosphere.

The temperature of exposure to air is very important. As Greiner and Ellis[4] have clearly shown, the absorption of contaminants at temperatures above 1625°F, the allotropic transformation of titanium, is much more marked than it is below that temperature. The temperature range of applicability of titanium then must be placed at below 1625°F as a first approximation.

Where then may titanium and its alloys be used at elevated temperature? It is of interest in this connection to plot the results of short-time tests at elevated temperatures of du Pont titanium forged rods[3] against Alcoa data on 24S-T extrusions and Allegheny-Ludlum data on annealed type 302 18-8 stainless steel, as is shown in fig. 2. Considering ultimate strength only, it is clear that field of usefulness of titanium at elevated temperature comes in an intermediate range between that of aluminum alloys and true high-temperature alloys. The yield strengths in general will tell the same story. The very low yield strength of annealed 18-8 is a characteristic of that specific alloy, and is not characteristic of high-temperature alloys as a whole.

The field of applicability of titanium at intermediate temperatures from, say, 400° to 800°F, is borne out by creep test results. The du Pont pamphlet points out that the creep of titanium at 800°F is approximately the same as high-strength aluminum alloys at 400°F. Tests conducted for 100 hr at 400°F and 50,000 psi and at 600°F and 20,000 psi produced negligible creep. Second-stage creep was found to be about 0.00009 units per hr at 800°F and 10,000 psi in a 300-hr test.

Titanium-Base Alloys

There are no titanium-base alloys to discuss at the present time, because none of the many laboratories working on the problem have disclosed appreciable information. However, one may confidently expect to see much information published on this subject in the next few years. A start toward this end was the data[5] reported in the symposium sponsored by the Office of Naval Research. Much of the data on alloys given there must be considered as the results of preliminary exploratory research.

There are certain aspects of the problem of alloying titanium that are worth discussing. The atomic size of the titanium atom is such that it makes a good size fit with many other metallic atoms, so that the potentialities for useful solid solution type of alloys are good. Secondly, titanium has an allotropic transformation from the hexagonal-close-packed structure to the body-centered-cubic structure at 1625°F. There is a small volume increase on heating through the transformation. There, then, is the possibility of

utilizing this transformation in titanium-base alloys in a similar way to the use of the alphagamma transformation of iron in iron base alloys. Third, titanium is a transitional metal with strong tendencies toward forming interstitial solid solutions with metalloids. This factor is responsible for the difference in properties between iodide titanium and the less pure kinds of titanium containing larger amounts of oxygen and nitrogen. Finally, as with practically all metallic alloying bases, there are the potentialities of producing age-hardening alloys with alloying elements whose solid solubilities decrease with temperature.

The position of oxygen and nitrogen in titanium-base alloys should be clarified. The statement, which is frequently made, that very small quantities of oxygen and nitrogen embrittle titanium, is, strictly speaking, not true. Confusion arises from the fact that large quantities of oxygen and nitrogen are very easily picked up in preparation for the metal and in the melting and/or fabrication of ingots. The brittle range with oxygen and nitrogen is approximately at concentrations over 0.5 weight percent, which is a very marked alloy concentration for these elements. A correct statement with respect to the effect of oxygen and nitrogen in titanium is that easily picked up quantities of oxygen and nitrogen embrittle titanium and render it nonductile.

With all the potential varieties of titanium-base alloys it will be exceedingly interesting to follow the progress in this field.

Prospects for widespread utilization of titanium may be considered to be bright, but it would be premature at this time to state that they are assured.

The Air Force, interested in titanium as a strong, light, corrosion-resistant metal for aircraft, is well along with a titanium program which is largely being carried out at Battelle Memorial Institute. This program was initiated as a result of exploratory research carried out for the Air Force's Project Rand. It not only included extensive work on alloy development but also has resulted in the development of the arc-melting technique and a continuous process for the production of ductile metal.

The U. S. Navy (titanium is particularly resistant to sea water corrosion) is also extremely active in investigating in titanium. The Navy has helped subsidize the Bureau of Mines for further work on titanium. In addition the Navy has had P. R. Mallory Co. investigating titanium alloys, and the Naval Research Laboratory, the Naval Engineering Experiment Station, and other installations are investigating other aspects of titanium and titanium alloys.

E. I. du Pont de Nemours and Co. in an amazingly short time got into large-scale pilot plant production of titanium, and by 1948 announced the availability of limited quantities of ductile titanium of 99.5 pct purity in sponge and ingot form. An affiliate, the Remington Arms Co., Inc., in cooperation with Battelle Memorial Institute, is now investigating properties and methods of forming, machining, and alloying titanium.

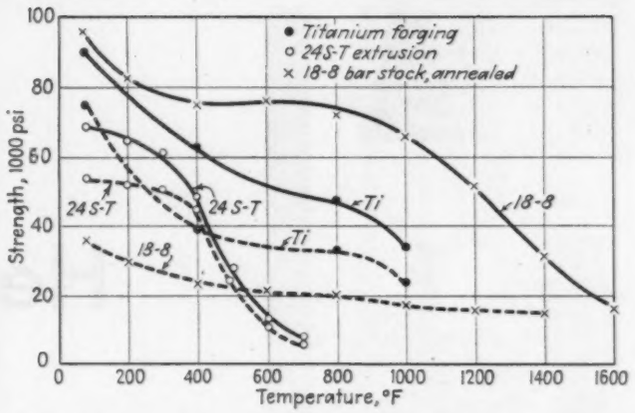

FIG. 2—Comparison of short-time elevated-temperature tensile tests of titanium with other common structural alloys. Solid lines represent ultimate tensile strength; broken lines represent yield strength at 0.2 pct offset.

Kennecott Copper Corp. and the New Jersey Zinc Corp., who are developing high-grade titanium-rich ilmenite deposits in Quebec, are interested in titanium metal as well as titanium oxide, and are considering methods of producing titanium metal cheaply.[5] Likewise, the National Lead Co., which has been in titanium oxide pigment production for many years, is now considering metal production.

The present relatively high cost of the metal, some $5 per lb in sponge or powder form, discourages the direct substitution of titanium for competitive metals, unless there is a clear-cut advantage to its use. Also, it will be necessary to await the outcome of alloy development work and service tests of parts and structures fabricated from titanium or its alloys before its relative merit with other materials can be evaluated. It is clear, however, that the first applications of the metal will be in military or aircraft applications where economic considerations are not so important as they are in civilian applications. These are the immediate applications which will support the titanium industry in its first few years. Within about 5 years, after the cost is lowered and the technology of the metal is worked out more thoroughly, the nonmilitary and non-aircraft applications can be expected to take hold to an increasing degree.

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[1] R. S. Dean, J. R. Long, F. S. Wartman and E. L. Anderson, "Preparation and Properties of Ductile Titanium," Trans. AIME, vol. 166, 1946, p. 369. Also, R. S. Dean, J. R. Long, F. S. Wartman and E. T. Hayes, "Ductile Titanium—Its Fabrication and Physical Properties," Trans. AIME, vol. 166, 1946, p. 382.

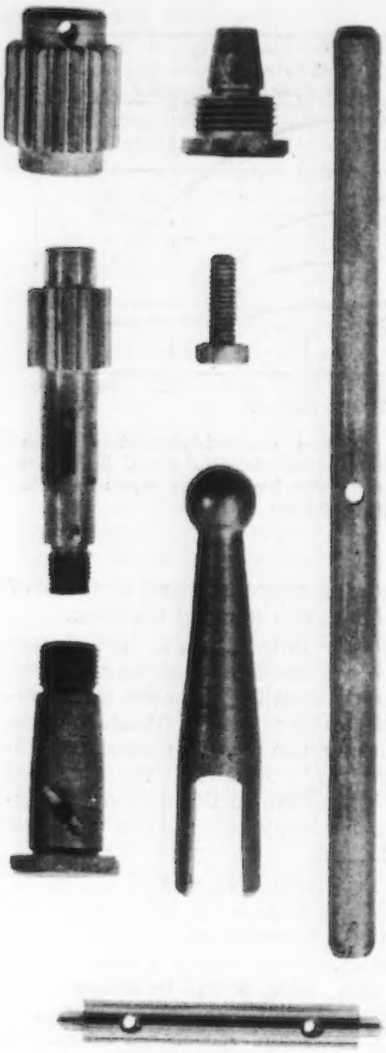
[2] I. E. Campbell, R. I. Jaffee, J. M. Blocher, Jr., Joseph Gurland and B. W. Gonser, Trans. Electrochemical Society, vol. 93, No. 6, June 1948.

[3] "Titanium Metal—99.5 Pct Pure," booklet published by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

[4] E. S. Greiner and W. C. Ellis, T.P. 2466, Metals Technology, September 1948.

[5] See THE IRON AGE, Dec. 30, 1948, p. 41 and Jan. 13, 1949, p. 58.

[6] "Rich Titanium Strike Enters Development Stage," Mining and Metallurgy, AIME, November 1948, p. 615.



SOME parts on which localized heat treatment is done in the "universal" machine described in this article. Some parts are only annealed locally, others are quenched after heating.

Localized Heat Treatment

A simple rotary flame heating machine, developed at Yale & Towne, promotes uniformity of product and lowers production costs. Adaptable to a wide variety of sizes and shapes of work pieces, the equipment can be utilized for local annealing as well as for heating and subsequent quenching. A description of the construction features of the machine is given by the author.

o o o

BY WILLIAM F. SORENSON

Chief Metallurgist & Controller of Product Finishes, Yale & Towne Mfg. Co., Philadelphia

o o o

LOCALIZED heat treatment is required on scores of steel parts used in industrial trucks, hoists and weighing scales produced in the new Philadelphia plant of Yale & Towne Manufacturing Co. Heating for such work is done with gas flames, usually oxyacetylene or propane and, in past practice, was done by hand. Since large numbers of duplicate parts were often involved, hand work was tedious, uniformity was not always attained and rejects resulted, increasing production costs.

To avoid these disadvantages and to improve average quality and lower costs, the heat-treating department developed several machines that do the heating, and when required, also the quenching, on an automatic or semi-automatic basis. The most useful of these machines has been termed "universal," as it is used for more than sixty different small parts, some of which are illustrated in this article.

With this machine, shown in fig. 1, setup time averages about 30 min. After the setup has been made, the operator generally need do nothing except to place each work piece in proper position on the slowly rotating dial or table. This carries the piece past the flame (or flames) and, when required, drops the piece into a quench tank; if only annealing is specified, the piece is pushed off automatically after the heating cycle.

With quantities of each part generally exceeding 200 per year and, in many cases sev-

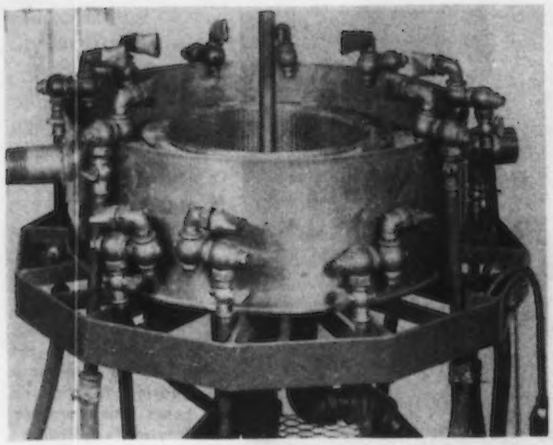


FIG. 1A—Universal Machine as it appears with the quench tank in place but without any dial attached to the vertical central shaft.

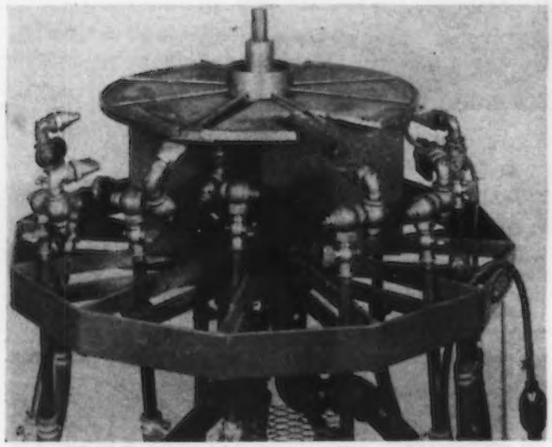


FIG. 1B—When equipped with this circular plate, parts are advanced by the spoked wheel. When they pass the bridge over the narrow gap, both ends of the piece are heated and parts drop off when the wide gap is reached.

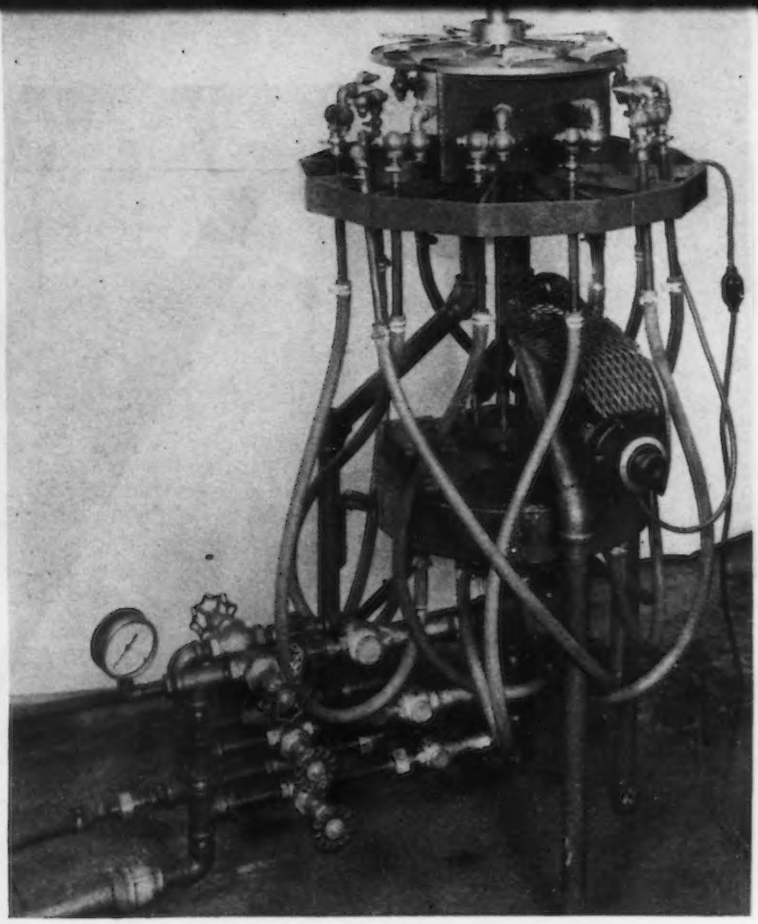


FIG. 1—Assembled machine as it appears without the quench tank and with the type of dial employed whereby the circular plate is fixed and parts above it rotate.

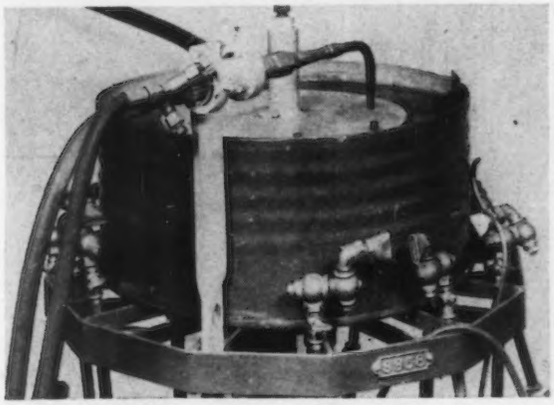


FIG. 1C—Setup for small cylindrical parts that are set vertically in holes in the rotating disk. After heating under the torch, the parts fall through a hole in a fixed disk below the rotating one and enter the quench.

eral thousand pieces, the annual savings are considerable. In one year, when lots of more than 60 different parts were run, the direct labor savings alone exceeded the cost of the machine. In addition, because human errors are avoided, uniformity in quality is attained and maintained, which in itself is a decided advantage.

Included in this machine is a vertical shaft, on the top end of which steel dials of different types are fitted. These dials are arranged to rotate at the desired speed, either continuously or with intermittent motion, depending upon the type of work and the time required for the flame (or flames) that play upon the work to heat specified areas to the required level. When the dial becomes too hot it is run partly submerged in a tray of water.

Below the dial is a cylindrical quench tank (see fig. 1A), into which the parts are automatically dropped or pushed at a predetermined point. A metal basket can be set in the quench to receive the parts, or the quench tank can be lifted off and a box, or basket, arranged to receive the parts when only annealing is required.

Supported around the outside of the machine are several clamps each of which is designed to hold a torch, as shown in fig. 1B. The torch can be set at any required height and angle and the flame from each torch can be adjusted to required length and width to effect the desired heating. This heating interval is timed auto-

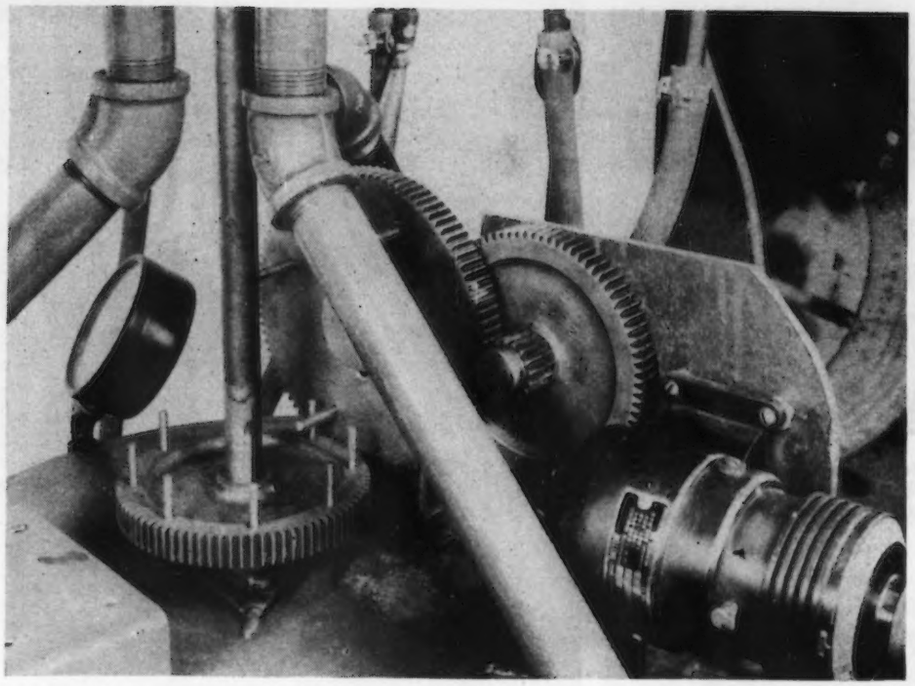


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FIG. 2—Driving mechanism for the vertical shaft between the two pipes. The motor at right drives through spur gearing to the pin gears which provide intermittent motion.

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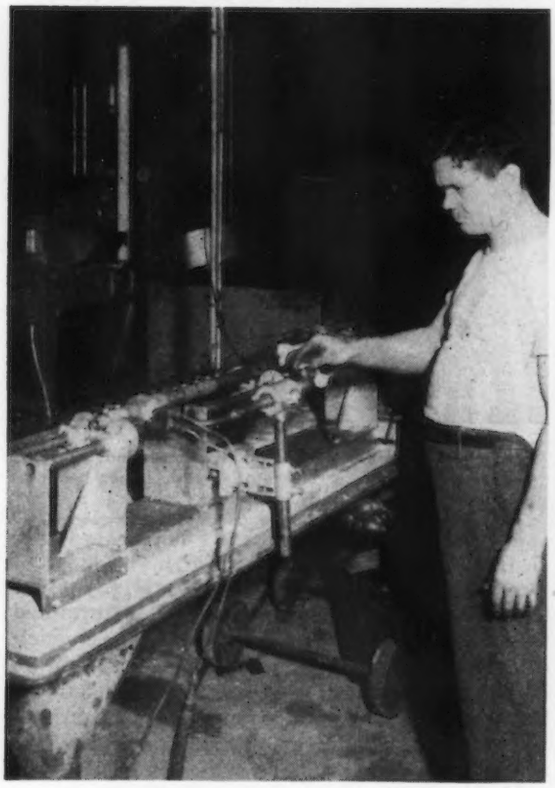

FIG. 3—Machine for heating pinion shafts that are rotated by driven disks that turn in vertical planes as a flame plays on the pinion. When the latter is up to quenching temperature, the shaft is lifted off and quenched.

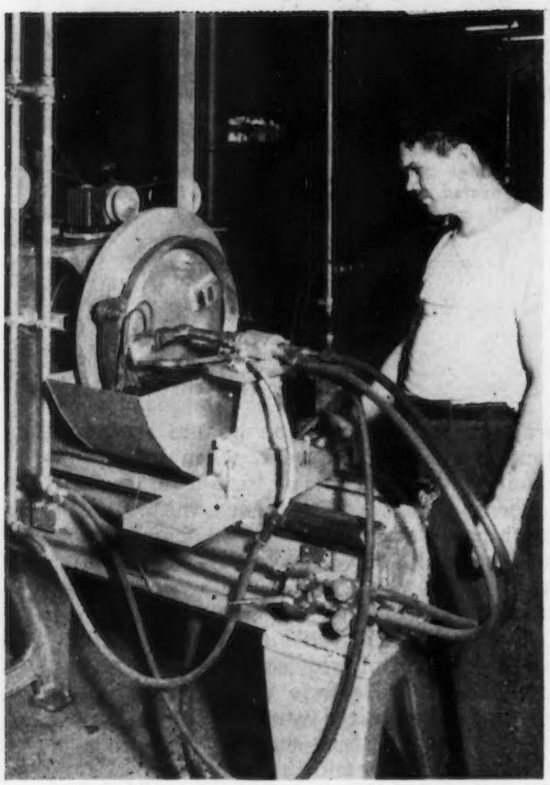

FIG. 4—In this machine, a ring whose bearing face is to be hardened is fastened to a rotating face plate and an oxyacetylene flame is applied. Just below the flame is a jet of quench water that plays on the surface just heated. Further cooling occurs in the water tank.

matically by correctly setting the driving mechanism that rotates the dial.

In general, a workpiece has a flat face on which it can be rested and will not change its position relative to the dial until it reaches the ejection point. If the work is cylindrical and can be set vertically, it can be dropped into a hole to hold it upright. As illustrated in fig. 1C, a fixed disk is placed below the dial and is provided with a hole set at the ejection point so that, when in registery with the hole, the piece drops through the guide hole in the dial and into the quench tank.

Parts that have curved or cylindrical surfaces on which they must rest may tend to rock or roll on a flat dial. In that case, trough-like supports are sometimes added, as in fig. 1. They can be pivoted so that they are tripped to eject the piece when they pass a gap in a fixed disk below the dial. Further motion then raises the trough to loading position by the time it arrives at the loading station.

The vertical shaft for the rotating dial is turned by gears that are driven by a small motor. When an intermittent motion is desired it is obtained by inserting a pin in the gears, as shown in fig. 2. Driving arrangements can be set so that the dial stops from 2 to 72 sec at two, four or eight stations.

This same machine is also used for silver brazing, the silver being applied, with flux, usually in the form of a ring of wire next to the joint. For this work, the part is heated until the silver melts and runs into the joint being brazed.

Another heat-treating machine developed in this plant is used for localized heating of pinion teeth on which either an oxyacetylene or an oxypropane flame is played radially while the shaft is rotated. In the case shown in fig. 3, the shaft rests on the edges of two sets of disks about 4 in. diam, that are rotated in opposite directions, causing the shaft to turn 600 to 800 rpm about its own axis. In this case, loading and unloading are done by hand, the shaft being removed when pinion teeth are up to proper temperature and quickly immersed in an adjacent oil quench. Time for heating depends upon the length and size of the pinion teeth, and ranges from 8 to 40 sec.

Still another machine is employed for flame hardening the bearing surface of 14-in. ring bearings as they are rotated slowly, one at a time in a vertical plane while an oxyacetylene flame is played on a portion of the surface. In the example illustrated in fig. 4, quenching is done by jets of water that are set to play on the heated surface just after it moves out of the heating area. In this setup, the rings are treated with minimum distortion and are given a hardness of 60 to 62 Rc.

. . . NEW BOOKS . . .

"Principles of Magnaflux," by F. B. Doane and C. E. Betz. Third edition of detailed text of nondestructive testing with Magnaflux. Covers many new methods, new materials, and new approaches and practices. Emphasis is on fundamentals. Well illustrated. Magnaflux Corp., 5908 Northwest Highway, Chicago 31. $5.00. 388 p.

* * *

"Inorganic Qualitative Analysis," by C. W. Griffin. Text deals with the methods of quantitative analysis and stresses, means of determining accuracy of the various methods and instruments used. Blakiston Co., 1012 Walnut St., Philadelphia 5. $4.50. 368 p.

* * *

"Structure and Properties of Alloys," by R. M. Brick and Arthur Phillips. Metallurgy and Metallurgical Engineering Series. Purpose of book is to correlate, in a systematic manner, alloy phase diagrams and property data with selected photographs of internal alloy structures. Second edition includes new data on magnesium alloys and corrosion and temperature resistant alloys. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. $6.00. 485 p.

"Moving Heaven and Earth," by D. F. Ackland. A well told record of the life and accomplishments of R. G. Le Tourneau, president of R. G. Le Tourneau, Inc. Replete with anecdotes and incidents illustrative of the industrial and spiritual philosophies of an unusual man. R. G. Le Tourneau, Inc., Peoria, Ill. $2.00. 224 p.

* * *

"Powder Metallurgy in Germany During the Period 1939-1945," by R. A. Hetzig. British Intelligence Objectives Subcommittee overall report No. 20. A summary of important and interesting items relating to powder metallurgy. Report contains an extensive reference listing to relevant reports and documents. British Information Services, 30 Rockefeller Plaza, New York 20. 20¢ postpaid. 27 p.

* * *

"1949 SAE Handbook." Thirty-one new standards and specifications are contained in this revision of the SAE Handbook. Included are new standards and specifications on body molding and fasteners, steel, nonferrous and other materials, and natural and synthetic rubbers. For the first time, SAE has established standards and specifications for ordering certain alloy steels by their hardenability ratings rather than chemical analysis. Minimum and maximum hardenability limits for each of the H steels are shown as tabular values of Rockwell C hardness. Society of Automotive Engineers, 29 W. 39 St., New York. $10.00. 933 p.

FIG. 1—This felt press casting broke at six places. The center break on the right end has a broken out piece that had to be welded back in place. All breaks have been beveled and the casting is ready for repair.

Welding Saves Press Casting

REPAIR of broken castings, large and small, by welding is becoming a widely used technique. A recent job with unusual characteristics was the repair of the large felt press casting. An accident fractured it at all four corners and at both ends of the center brace, and one piece of the casting was broken out, as shown at the right of fig. 1. Replacement of the casting was estimated at five weeks. Rather than have the press out of service for that length of time, it was decided that a weld repair be attempted.

The repaired casting, after welding, would have to be as strong as a new one or the work would be a waste of time. Furthermore, the job of preheating for welding was difficult because of the lack of a preheating oven large enough to handle so large a piece. After welding, the welding alloy had to be machinable, because the face of the casting had to be finished.

EutecRod 14FC, a gas welding rod manufactured by Eutectic Welding Alloys Corp., New York, was chosen because it was designed to produce a weld metal of more than 48,000 psi tensile strength and to bond at the low temperature range of 950° to 1400°F. The rod is a high carbon-high silicon core wire with a coating adjusted to promote fluidity and bond at the lowest possible base metal temperature.

The breaks in the casting were chipped so that 90° V's were formed when the broken pieces were fitted together, and the entire weld area was cleaned to remove dirt, scale, grease and rust. Because of the intricacy and the size of the casting, the welder decided to take simple measures to produce a slight preheat that would take the chill out of the cast iron. Grates, as shown in fig. 1, were used to support charcoal fires to heat the casting. As soon as the casting temperature reached 700° to 800°F, welding was started.

With Eutector Flux 14 sprinkled on the weld area, a neutral flame was used to heat a 1-in. section of the immediate weld area until the first dull red color became apparent. Then a drop of metal from the end of a 3/16-in. electrode was melted onto the surface. The flame was kept moving in a weaving motion using a forehand welding technique with the torch tip at a 30° angle to the casting. The flame cone wasn't permitted to touch the surface and, as the molten alloy bonded to the base metal, the force of the flame pushed the flowing alloy ahead. Additional weld metal was added as needed by dipping the end of the rod into the molten pool and moving it slowly forward with the flame.

At no time during the welding operation was there any melting of the cast iron. Bonding was achieved entirely through the process of surface alloying. If a gas pocket or inclusion occurred, it was quickly removed by weaving the flame over the deposit around the defective spot until the weld surface melted and the bubble or inclusion floated to the top. When the weld was finished, flame was played along the deposit to equalize the heat in part. The completed weld was covered with asbestos paper and allowed to cool slowly.

The weld sequence was from the center of the broken casting outward. The missing section at the right of fig. 1 was first welded into place and the center joint restored. The center section of the casting was kept hot and the upper joint was welded. Then, keeping the lower part of the center section hot, the lower joint was welded. This procedure was duplicated on the breaks at the other end of the casting. The repaired casting is shown in fig. 2.

Using this technique, all breaks were repaired. Total welding time was 7 hr and 22 lb of welding electrode was required. After the casting cooled, it was sent to the machine shop where the slight amount of excess metal was quickly removed from the face. The rebuilt casting was reassembled in the felt press and put into immediate use.

FIG. 2—Ashes and grates were used for charcoal fires to provide slight preheat. Note the long rods used in the weld repair. Two standard rods were welded together to permit more continuous metal addition without interruption.

Performance Data for

High Vacuum Pumps

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Collins Radio Co.,
Cedar Rapids, Iowa

THE accompanying tables contain basic data on high vacuum pumps, including their performance characteristics, costs, manufacturers, greases, oils, fluids and other pertinent information to serve as a general guide for the engineer interested in vacuum pumps. The author gratefully acknowledges the generous cooperation of the manufacturers of pumps in supplying the extensive information presented here.

There is an increasing need for a clearing office where these data can be kept up to date and revised information can be issued to holders of a "Pump Handbook" similar to the Tube Handbook which has become an indispensable service to electronic engineers.

There is need for the organization of vacuum tube engineers into a professional group and such a venture has been under discussion. Much is to be done with regard to the standardization of the usage of terms and test procedures which apply to the evaluation of high vacuum pumps. In the absence of such clarification, the reader is urged properly to appraise the published data, especially when comparing different makes. The data presented herewith can be a guide at best to arouse curiosity about individual pumps and more detailed information should be procured from the manufacturer before writing a purchase order. Prices for mechanical pumps sometimes include additional gear which is charged for separately by others so that, here too, a close comparison to the last decimal point is not fair.

In a brief introduction such as this it is impossible to familiarize the novice in the field of high vacuum technique with the fine points of pumps nor to give him a clear overall picture. As a substitute, some reference to the literature are given. The wide scope and great importance which high vacuum technology has attained is well illustrated by the papers presented at the Cambridge high vacuum symposium in October 1947.[1] The broad scientific aspects of high vacuum are treated in great detail in the recently published book by Dushman.[2] This treatise probably represents the life work of the "father of vacuum technique" in this country and cannot be too highly recommended to the scientific worker in the field. The more practical worker will find a general introduction to pumps in a number of books[3, 4] and articles.[5, 6, 7, 8] High vacuum techniques assume an ever-increasing importance in the metallurgical field in the production of high refractory metals which are notorious for their affinity for various gases. Titanium, zirconium and tantalum are examples. Vacuum brazing of

TABLE I—HIGH VACUUM DIFF

Manufacturer	Pump Designation	Material, Metal or Glass	Type Number	Catalog Number	Number of Stages	Limiting Pressure, MM Hg	Fore Pressure, Microns	Fore Pump Speed		Pu				
										1.0		10^{-1}		
								L/S	CFM	L/S	CFM	L/S	CFM	L
National Research Corp., Cambridge, Mass.	Vertical Purifying	M	H-2P	113	3	2×10^{-7}	100	0.35	0.75					
	Vertical Booster	M	B-6	107	2	1×10^{-4}	900	47.2	100			118	250	
	Vertical Purifying	M	H-6P	104	3	2×10^{-7}	150	11.8	25					
	Vertical Diffusion	M	H-10	108	3	1×10^{-6}	450	23.6	50			47.2	100	
	Vertical Purifying	M	H-16P	116	3	2×10^{-7}	250	46	100					
Eitel-McCullough, Inc., San Bruno, Cal.	Vertical Diffusion	G/M	HV-1	.....	3	4×10^{-7}	20	0.1-2 At 1 Micron	0.2-4.2 At 1 Micron			With Stand., Baffle Without Baffle		
Litton Industries, San Carlos, Cal.	Vertical Diffusion	M	250	.....	2	(a) 1×10^{-6} (b) 5×10^{-8} (c) 5×10^{-7}	10	Depends on Through Volume		(a) Pump Only, at Inlet / Pump and Water Baffle, at Inlet (b) Pump, Water and Charcoal Baffles, at (c) Pump, Water, Charcoal Baffles and Va				
Central Scientific Co., Chicago	Mercury Diffusion (Supervac)	M	.....	93201	1	5×10^{-6} 2×10^{-6}	10 1	.....	.....	.....	.....	.....	.....	
Distillation Products, Inc., Rochester, N. Y.	Mercury Diffusion	G	GHG-10	8032	2	$<1 \times 10^{-6}$	1600	0.3	0.7	.....	.....	0.2	0.5	
	Mercury Diffusion	G	GHG-10S	8076	2	$<1 \times 10^{-6}$	6000	0.3	0.7	.....	.....	0.2	0.5	
	Mercury Diffusion	G	GHG-15D	8155	3	$<1 \times 10^{-6}$	9000	0.3	0.7	.....	.....	4.0	8.5	
	Mercury Diffusion	M	MHG-50	8020	2	$<1 \times 10^{-6}$	350	0.3	0.7	.....	.....	0.3	0.6	
	Horizontal Booster	G	GB-3	8036	2	5×10^{-5}	.....	0.5	1.1	.....	.....			
	Vertical Single Stage	G	G-4	8022	1	8×10^{-6}	100	0.5	1.1	.....	.....	1.0	2.12	
	Horizontal Fractionating	G	GF-5A	8088	2	5×10^{-7}	170	0.5	1.1	.....	.....			
	Horizontal Fractionating	G	GF-20A	8143	2	7×10^{-7}	200	0.1	0.2	.....	.....			
	Horizontal Fractionating	G	GF-20W	8142	2	7×10^{-7}	200	0.1	0.2	.....	.....			
	Horizontal Fractionating	G	GF-25A	8014	3	5×10^{-8}	160	0.1	0.2	.....	.....			
	Horizontal Fractionating	G	GF-25W	8013	3	5×10^{-8}	160	0.1	0.2	.....	.....			
	Vertical High Speed	G/M	GM-220AB	8097	3	1×10^{-5}	300	0.5	1.1	.....	.....			
	Vertical High Speed	G/M	GM-220WB	8098	3	1×10^{-5}	300	0.5	1.1	.....	.....			
	Vertical Booster	M	VMB-1	8070	1	1×10^{-4}	.....	0.1	0.2	.....	.....	0.5	1.1	
	Vertical Booster	M	VMB-7	8137	1	1×10^{-4}	.....	0.5	1.1	.....	.....	3.0	6.4	
	Vertical Booster	M	VKB-8	8156	1	1.5×10^{-3}	450	1.0	2.1	.....	.....	5.8	12.3	
	Vertical Booster	M	MB-100	8087	2	5×10^{-5}	400	5.0	10.6	.....	.....	5.0	11.2	
	Vertical Booster	M	MB-200	8008	2	5×10^{-5}	260	5.0	10.6	.....	.....	25.0	53.0	
	Vertical Booster	M	MB-300	8197	2	5×10^{-5}	465	40.0	85.0	.....	.....	70.0	148.0	
	Vertical Booster	M	KB-75	.....	1	1×10^{-4}	330	10.0	21.5	.....	.....	65.0	138.0	
	Vertical Booster	M	KB-150	8160	1	1×10^{-4}	300	40.0	85.0	.....	.....	175.0	371.0	
	Horizontal Booster	M	KB-300	8090	1	8×10^{-3}	750	40.0	85.0	120	254	300.0	636.0	
	4 in. Dia., Vertical High Speed	M	MC-275	8006	3	5×10^{-6}	135	5.0	10.6	.....	.....	10.0	21.2	
	6 in. Dia., Vertical High Speed	M	MC-500	8004	3	5×10^{-6}	275	5.0	10.6	.....	.....	50.0	110.0	
	14 in. Dia., Vertical High Speed	M	MC-3000	8186	3	5×10^{-6}	135	40.0	85.0	.....	.....	40.0	85.0	
	20 in. Dia., Vertical High Speed	M	MC-7000	8024	3	5×10^{-6}	65	40.0	85.0	.....	.....	40.0	85.0	
	32 in. Dia., Vertical High Speed	M	MC-15000	.....	3	5×10^{-6}	60	40.0	85.0	.....	.....	150.0	318.0	
	Vertical Fractionating	M	VMF-2A	8082	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-2W	8074	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-5A	8063	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-5W	8064	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Horizontal Booster	G	GB-25	8204	2	5×10^{-5}	800	0.5	1.1	.....	.....			
	Vertical Booster	M	KS-100-V2	.....	2	10^{-5}	1000	2	4.2	.....	.....			
	Vertical Fractionating	M	VMF-10A	8054	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-10W	8058	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-20A	8056	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-20W	8055	2	1×10^{-6}	100	0.1	0.2	.....	.....			
	Vertical Fractionating	M	VMF-50	8062	2	1×10^{-6}	100	0.5	1.1	.....	.....			
	Vertical Fractionating	M	VMF-80	8187	3	5×10^{-7}	100	0.5	1.1	.....	.....			
	Vertical Fractionating	M	VMF-100	8067	2	1×10^{-6}	100	0.5	1.1	.....	.....			
	Vertical Fractionating	M	VMF-260	8148	3	4×10^{-7}	100	0.5	1.1	.....	.....			
	4 in. Dia., Vertical Fractionating	M	MCF-300	.....	3	7×10^{-7}	175	5.0	10.6	.....	.....			
	6 in. Dia., Vertical Fractionating	M	MCF-700	8171	3	5×10^{-7}	100	5.0	10.6	.....	.....			
	10 in. Dia., Vertical Fractionating	M	MCF-1400	.....	4	5×10^{-7}	275	10.0	21.0	.....	.....			
	16 in. Dia., Vertical Fractionating	M	MCF-5000S	.....	2+MB200	1×10^{-6}	50+300	40.0	35.0	.....	.....			
	16 in. Dia., Vertical Fractionating	M	MCF-5000	.....	3	7×10^{-7}	170	40.0	85.0	.....	.....			
F. J. Stokes Machine Co., Philadelphia	Vertical Diffusion	M	147-C	.....	3	1×10^{-5}	200	7.0	15.0	.....	.....	7.0	15.0	
	Vertical Diffusion	M	147-D	.....	1	1×10^{-5}	300	54.3	115.0	.....	.....	54.3	150.0	

* This includes price of pump only. Other costs are as follows: Pump and water baffle, $210; pump, water and charcoal baffles, $250; pump, water and charcoal baffle and high vacuum valve, $3

DIFFUSION PUMP DATA

Pumped at Various Pressures, MM Hg									Recommended Pump Fluid	Amount of Pump Fluid	Heater Power Watts	Cooling Means A = Air W = Water	Overall Dimensions, In.			Inlet Flange, In.		Pump Cost $
10^{-3}		10^{-4}		10^{-5}		10^{-6}												
L/S	CFM	L/S	CFM	L/S	CFM	L/S	CFM					H	W	L	O. D.	I. D.	
40	88	50	110	50	110.0	30.0	66.0	Octoil or Octoil S....	70 cc.	200	W	15	7	.....	2¼	.....	125
387	820	330	700	.....	.....	.....	.....	Narcoil 10	3 gal.	6000	W	49	18¾	.....	11	.....	845
230	500	640	1400	550	1200	182.0	400	Octoil or Octoil S....	400 cc.	950	W	28	16	.....	11	.....	335
1225	2600	1462	3100	708	11,500	.....	.....	Narcoil 10.....	1000 cc.	2250	W	41½	22⅞	.....	16	.....	437
1820	4000	4550	10,000	4550	10,000	1350	3000	Octoil or Octoil S....	800 cc.	4000	W	53	30	.....	23½	.....	1400
32.5	69	32	68	34	72.0	19.5	41.4	Eimac Type A.....	150 cc.	180	A	25	5¼	11¼	.....	(2)	125
60.5	126.5	68	144	71.5	152.0	40.0	85.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
				280	595.0	.....	.....	Litton Type C.....	130 cc.	375							
				200	424.0	.....	.....	Silicone DC702.....	4.5 oz.	400	W	18½	7¼	.....	3½	3⅜	195*
				85	180.0	.....	.....	Silicone DC703.....	110 g	425							
				65	138.0	.....	.....										
.....	.....	.....	.....	.....	.....	7.0	14.8	Mercury.....	300 g	250	W	.....	.....	.....	2½	.....	73
4.7	10.0	3.3	7.0	0.9	1.9	.....	.....	Mercury.....	1090 g	200	W	26	8	5	$1\frac{17}{64}$	$1\frac{1}{64}$	90
4.7	10.0	3.3	7.0	0.9	1.9	.....	.....	Mercury.....	1500 g	430	W	29	7	12	$1\frac{3}{16}$	$1\frac{1}{32}$	130
19.0	40.0	14.0	30.0	5.0	10.6	.....	.....	Mercury.....	1090 g	500	W	26	8	5	2	.....	170
55.0	107.0	65.0	138.0	40.0	85.0	.....	.....	Mercury.....	2590 g	500	W	16	10	6	6	3⅞	140
3.0	6.4	3.0	6.4	.....	.....	.....	.....	Butyl Pthalate.....	150 g	120	W	20	6	16	1½	$1\frac{5}{16}$	180
9.3	19.7	4.8	10.2	0.5	1.1	.....	.....	Octoil.....	65 g	40	A	14½	4½	9	1¼	$1\frac{1}{16}$	40
2.6	5.5	2.6	5.5	1.8	3.8	0.3	0.64	Octoil or Octoil S....	50 g	60	A	9	3½	10¼	$\frac{9}{16}$	½	165
26.0	55.0	26.0	55.0	22.0	47.6	0.2	0.5	Octoil or Octoil S....	130 g	175	A	14	5	16	1¼	1⅛	150
26.0	55.0	26.0	55.0	22.0	47.6	0.2	0.5	Octoil or Octoil S....	130 g	175	W	14	5	16	1¼	1⅛	180
27.0	57.0	31.0	66.0	31.0	66.0	17.0	36.0	Octoil or Octoil S....	200 g	170	A	14	5	24	2	$1\frac{13}{16}$	220
27.0	57.0	31.0	66.0	31.0	66.0	17.0	36.0	Octoil or Octoil S....	200 g	170	W	13	5	25	1¼	$1\frac{1}{16}$	260
100.0	212.0	235.0	498.0	.....	.....	.....	.....	Amoil-S or Octoil....	200 g	230	A	24	7	11	5½	4	160
100.0	212.0	235.0	498.0	.....	.....	.....	.....	Amoil-S or Octoil....	200 g	230	W	24	7	11	5½	4	205
0.7	1.5	.....	.....	.....	.....	.....	.....	Butyl Pthalate.....	55 g	275	W	8	4	4	1½	$1\frac{7}{16}$	96
3.0	6.4	.....	.....	.....	.....	.....	.....	Butyl Pthalate.....	100 g	325	W	11	5¼	5¼	2½	$1\frac{7}{16}$	115
.....	.....	.....	.....	.....	.....	.....	.....	Myvane 10.....	200 g	815	W	26	10	10	3¾	1⅛	325
120.0	250.0	80.0	170.0	.....	.....	.....	.....	Butyl Pthalate.....	225 g	375	W	11	5¼	5¼	6	3⅞	125
240.0	510.0	150.0	318.0	.....	.....	.....	.....	Butyl Pthalate.....	600 g	640	W	23½	9	13½	9	6	195
265.0	562.0	200.0	424.0	.....	.....	.....	.....	Butyl Pthalate.....	1800 g	1800	W	30½	12	17½	12	8⅜	390
10.0	21.0	.....	.....	.....	.....	.....	.....	Myvane 20.....	5700 g	2425	W	42	16	25	6	2⅞	.....
100.0	210.0	.....	.....	.....	.....	.....	.....	Myvane 20.....	9500 g	2800	W	58	15	27	11	6	800
.....	.....	.....	.....	.....	.....	.....	.....	Myvane 10.....	21,000 g	3350	W	72	72	24	11	6	1550
210.0	445.0	175.0	372.0	95.0	202.0	.....	.....	Octoil or Amoil S....	200 g	350	W	20	6	12	6	3⅞	155
410.0	870.0	470.0	1000	330.0	700.0	.....	.....	Octoil or Amoil S....	600 g	730	W	30	9	15	9	6	230
3200	6800	3100	6560	2100	4450	.....	.....	Octoil or Myvane 20	5000 g	2400	W	42½	19	27	19	13⅞	950
6400	13600	5500	11670	4000	8500	.....	.....	Octoil or Myvane 20	10,000 g	3750	W	62¼	28	36	28	20	1400
3000	6350	18,000	38,200	13,000	27,600	.....	.....	Octoil or Myvane 20	20,000 g	6000	W	80	38	53	38	32	.....
2.6	5.5	2.3	5.0	0.7	1.5	.....	.....	Octoil or Octoil S....	35 g	85	A	4½	3	3	1	$\frac{15}{16}$	62
2.6	5.5	2.3	5.0	0.7	1.5	.....	.....	Octoil or Octoil S....	35 g	85	W	4½	3	3	1	$\frac{13}{16}$	62
3.2	6.8	4.2	8.9	1.3	2.8	.....	.....	Octoil or Octoil S....	35 g	85	A	5⅞	3	3	1⅛	$1\frac{1}{16}$	65
3.2	6.8	4.2	8.9	1.3	2.8	.....	.....	Octoil or Octoil S....	35 g	85	W	5⅞	3	3	1⅛	$1\frac{1}{16}$	65
30	64	28	59	.....	.....	.....	.....	Butyl Pthalate.....	150 g	280	W	22	4	8	2⅛	2	240
140	300	100	212	.....	.....	.....	.....	Myvane 20.....	1000 g	900	W	22½	11	12	6	3½	.....
11.0	23.0	11.0	23.0	4.0	8.5	.....	.....	Octoil or Octoil S....	55 g	135	A	$7\frac{5}{16}$	3⅞	3⅞	1½	$1\frac{7}{16}$	75
11.0	23.0	11.0	23.0	4.0	8.5	.....	.....	Octoil or Octoil S....	55 g	135	W	$7\frac{5}{16}$	3⅞	3⅞	1½	$1\frac{7}{16}$	75
22.0	47.0	20.0	42.0	9.0	19.2	.....	.....	Octoil or Octoil S....	100 g	200	A	9⅝	5¼	5¼	2	$1\frac{15}{16}$	85
22.0	47.0	20.0	42.0	9.0	19.2	.....	.....	Octoil or Octoil S....	100 g	200	W	9⅝	5¼	5¼	2	$1\frac{15}{16}$	85
30.0	64.0	50.0	106.0	25.0	53.0	.....	.....	Octoil or Octoil S....	150 g	325	W	11⅜	6¼	6¼	2½	$2\frac{7}{16}$	110
60.0	64.0	90.0	192.0	100.0	212.0	80.0	170.0	Octoil or Octoil S....	150 g	350	W	17½	6¼	6¼	2½	$2\frac{3}{16}$	155
50.0	106.0	108.0	229.0	85.0	180.0	.....	.....	Octoil or Octoil S....	300 g	375	W	$14\frac{7}{16}$	$7\frac{5}{16}$	$7\frac{5}{16}$	3½	$3\frac{7}{16}$	135
5.0	10.6	100.0	212.0	100.0	212.0	5.0	10.6	Octoil or Octoil S....	800 g	340	W	16	7⅜	9½	6	3⅜	195
250	530	320.0	675	200.0	425.0	75.0	160	Octoil or Octoil S....	225 g	405	W	17¾	6½	12½	6	3⅞	.....
380.0	805.0	650.0	1380	480.0	1018	100.0	212.0	Octoil or Octoil S....	500 g	775	W	29	9	14	9	6	300
1700.0	3600.0	1450	3070	800.0	1700	100.0	212.0	Octoil or Octoil S....	5000 g	2450	W	36	14	18	14	10	.....
1500	3160	4600	9730	3400	7180	.....	.....	Octoil or Octoil S....	6600 g	2400+1000	W	39	23	42	23	16	.....
1000	2120	5000	10,500	3500	7400	.....	.....	Octoil or Octoil S....	6600 g	3500	W	43	23	30	23	16	.....
470.0	1000.0	470.0	1000.0	.....	.....	.....	.....	Arochlor 1254.....	1.5 pt	1300	W	33	20	45	11	6	1370**
118.0	250.0	11.8	25.0	.....	.....	.....	.....		3.0 gal	1800	W	56	24	56	11	6	2625

** Cost includes forepump, McLeod gage electric controls.

TABLE II

* Characteristics of Various Types of Commercial Mechanical High Vacuum Pumps

Manufacturer	Pump Designation	Number of Stages	Limiting Pressure	Free Air Displacement at Intake for P = 1 Atm		Pumping Speed At 100 Microns		Pumping Speed At 10 Microns		Pumping Speed At 1 Micron		Pump Revol.	Motor Size	Pump Cost Excl. Motor
			Microns	L per Sec	CFM	L per Sec	CFM	L per Sec	CFM	L per Sec	CFM	RPM	HP	$
Kinney Manufacturing Co., Boston	VSD 556	1	5	5.2	13.1	3.9	8.3	1.5	3.2	0	0	450	½	270.60
	VSD 778	1	5	12.73	27.0	7.9	16.8	3.3	7.0	0	0	360	1½	484.44
	VSD 8811	1	5	22.0	46.7	13.7	29.0	5.7	12.0	0	0	360	2	610.50
	DVD 8810	1	5	51.8	110.0	33.0	70.0	14.1	29.9	0	0	450	5	925.32
	DVD 12814	1	5	103.0	218.0	64.0	135.7	28.2	59.9	0	0	415	10	1822.94
	DVD 14918	1	5	146.8	311.0	92.0	195.0	37.8	80.2	0	0	360	15	2228.82
	DVD 141418	1	5	229.0	485.0	144.0	305.0	59.0	125.0	0	0	360	25	2780.58
	DVD 181420	1	5	331.0	702.0	205.0	435.0	82.5	175.0	0	0	360	40	4224.66
	CVD 556	2	0.1	7.2	15.2	5.6	11.9	4.7	10.0	3.8	8.1	525	1	532.62
	CVD 8610	2	0.1	21.7	46.0	16.3	34.6	13.9	29.4	11.1	23.6	500	3	1149.72
Central Scientific Co., Chicago	Hyvac 91105	2	0.2	0.18	0.38	0.1	0.21	0.09	0.19	0.08	0.17	350	⅓	63.00
	Megavac 92110	2	0.05	0.52	1.1	0.3	0.64	0.28	0.6	0.20	0.42	325	⅓	138.00
	Megavac 92015	2	0.07	0.95	2.0	0.78	1.66	0.52	1.1	0.37	0.79	600	½	132.00
	Hypervac-23 93006	2	0.2	4.0	8.5	3.0	6.4	2.20	4.7	0.30	0.64	510	½	275.00
	Hypervac-25 93020	2	0.05	4.40	9.3	2.90	6.15	2.50	5.3	2.10	4.45	570	½	435.00
	Hypervac-100 93033 S	2	0.02	16.00	34.0	12.00	25.40	11.00	23.3	11.00	23.30	450	2	1375.00
	Pressovac-4 90515	1	3	0.58	1.2	0.5	10.6	0.34	0.72	0	0	600	⅓	65.00
W. M. Welch Scientific Co., Chicago	Miniat Duo Seal 1395	1	<25	0.20	0.42	0.09	0.19	0	0	0	0	1725	½	100.00
	Vac Dis illation 1404	1	<20	0.56	1.18	0.38	0.81	0	0	0	0	300	⅓	65.00
	Duo Seal 1406	1	5	0.56	1.18	0.48	1.03	0.30	0.63	0	0	300	⅓	65.00
	Duo Seal 1403	1	5	1.67	3.53	1.30	2.78	0.58	1.23	0	0	375	½	125.00
	Duo Seal 1400	2	0.05	0.35	0.74	0.17	0.37	0.16	0.35	0.13	0.28	450	⅓	65.00
	Duo Seal 1405 H	2	0.05	0.56	1.18	0.40	0.85	0.33	0.71	0.23	0.50	300	⅓	145.00
	Duo Seal 1405 B	2	0.05	0.97	2.05	0.64	1.36	0.53	1.15	0.39	0.83	525	½	145.00
	Duo Seal 1397 B	2	0.10	5.0	10.6	4.0	8.5	3.33	7.1	2.5	5.5	300	¾	400.00
F. J. Stokes Machine Co., Philadelphia	Microvac 148	1	10	7.1	15.0	4.71	10.0	0	0	0	0	500	1	290.00
	Microvac 148	1	8	15.1	32.0	11.8	25.0	5.7	12.0	0	0	370	1½	450.00
	Microvac 149	1	5	28.2	60.0	21.2	45.0	9.4	20.0	0	0	385	3	605.00
	Microvac 212	1	2	54.2	115.0	42.5	90.0	18.9	40.0	0	0	385	5	860.00
	Microvac 412	1	2	110.7	235.0	89.7	190.0	37.7	80.0	0	0	400	7½	1460.00
	Microvac 612	1	2	246.5	500.0	189.0	400.0	82.5	175.0	0	0	500	2–7½	2580.00
Beach-Russ Co., New York	Class D RP 15	1	2	8.03	17.0	5.8	12.3	3.5	7.5	0	0	200	½	•
	RP 30	1	2	16.5	35.0	11.5	24.5	7.1	15.0	0	0	200	1	•
	RP 50	1	2	27.35	58.0	19.4	41.0	11.6	24.5	0	0	200	2	•
	RP 100	1	2	54.2	115.0	36.7	78.0	19.8	42.0	0	0	200	5	•
	RP 250	1	2	141.5	300.0	95.4	202.0	56.6	120.0	0	0	200	10	•
	RP 375	1	2	202.5	430.0	139.0	295.0	83.1	176.0	0	0	200	15	•
	RP 750	1	2	388.0	845.0	278.0	590.0	162.8	345.0	0	0	200	40	•

* Prices now being revised and therefore not included.

large components for electron tubes, where purity and freedom from gas inclusions are important, also requires very special techniques.

The organization of the charts is self-explanatory and little need be added. Speed measurements are assumed to have been made without the use of freezing traps except in the case of mercury pumps. All D.P.I. values for limiting fore-pressure are static, i.e. the value of fore-pressure at which the diffusion pump jet fails when the forepump is throttled or a leak introduced in the fore-vac. line. The type of gage used and its location in the system has a pronounced bearing on the values obtained for limiting fore-pressure, pump speeds and ultimate pressure. As different measuring techniques are in use by different manufacturers, one must make proper allowances for these discrepancies.

The author wishes to express appreciation to all companies who have so generously cooperated in this venture and also to acknowledge

TABLE III

Conversion of Pressure Units

	Dynes per sq cm (Barye Microbar)	G per sq cm	Psi	Atmospheres	Mm Hg (Tors)	Microns	Bars
Dyne per sq cm (Barye Microbar)	1	1.0197×10^{-3}	1.4504×10^{-5}	9.8692×10^{-7}	7.5006×10^{-4}	7.5006×10^{-1}	1×10^{-6}
G per sq cm	980.66	1	1.4223×10^{-2}	9.6784×10^{-4}	7.3556×10^{-1}	7.3556×10^{2}	9.8066×10^{-4}
Psi	6.8947×10^{4}	70.307	1	6.8046×10^{-2}	51.715	51.715×10^{3}	6.8947×10^{-2}
Atmosphere	1.0133×10^{6}	1.0332×10^{3}	14.696	1	760	7.6×10^{5}	1.0133
Mm Hg (Tor)	1.3332×10^{3}	1.3595	1.9337×10^{-2}	1.3158×10^{-3}	1	1×10^{3}	1.3332×10^{-3}
Micron	1.3332	1.3595×10^{-3}	1.9337×10^{-5}	1.3158×10^{-6}	1×10^{-3}	1	1.3332×10^{-6}
Bar	1×10^{6}	1.0197×10^{3}	14.504	9.8692×10^{-1}	7.5006×10^{2}	7.5006×10^{5}	1

the assistance given by the management of Collins Radio Co., which made possible the distribution of the charts in the past.

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TABLE IV

Vacuum Grease Characteristics

Product	Use	Vapor Pressure, Mm Hg	Max., Temp., °C
Apiezon[1] Grease L	Closely fitting ground joints (not for stopcocks)	10^{-3} at 300°C; unmeasurable at room temps.	30
Apiezon Grease M	Places where a grease of moderately low vapor pressure is required	10^{-3} at 200°C; 10^{-6} at room temp.	30
Apiezon Grease N	Stopcocks; also places exposed to heat, and where a grease of higher viscosity is desired	Unmeasurable at room temp.	30
Celvacene,[3] Light	Stopcocks, ground joints, etc., in high temperature application	Less than 10^{-6}	Melting point above 90°
Celvacene, Heavy	Rubber gaskets, rubber to metal joints, etc., high temperature	Less than 10^{-6}	Melting point above 130°
Vacuseal,[2] Light	Stopcocks, ground joints		Melts above 50°
Vacuseal, Heavy	Stopcocks, ground joints		Melts above 60°
Silicone	Stopcocks, ground joints		Workable from −40° to 200°

[1] James Biddell Co., Philadelphia.
2 Central Scientific Co., Chicago.
[3] Distillation Products Co., Rochester, N. Y.

TABLE V

Characteristics of Diffusion Pump Fluids

Supplier	Oil Type	Vacuum Attainable, Mm Hg
J. G. Biddle Co., Philadelphia Shell Oil Co.	Apiezon Oil A Apieson Oil B	10^{-5} 10^{-6}
Eitel McCullough, Inc., San Bruno, Calif.	Eimac Pump Oil	Approx., 3×10^{-7}
Distillation Products, Inc., Rochester, N. Y.	Butyl Phthalate Butyl Sebacate Amoil Amoil-S Octoil Octoil-S Myvane Dp-20	4×10^{-5} 2×10^{-5} 7×10^{-6} 2×10^{-6} 2×10^{-7} 5×10^{-8} 5×10^{-6}
Litton Industries, San Carlos, Calif.	Litton Type "C"	3×10^{-7}
Dow Corning Corp., Midland, Mich.	Silicone Fluids No. 702 and No. 703	5×10^{-8}
National Research Corp., Vacuum Engineering Division, Boston	Type TS Diffusion Pump Oil	2×10^{-5}

TABLE VI

Characteristics of Apiezon Waxes[1]

Product	Use	Vapor Pressure, Mm Hg	Max. Temp., °C	Temp. for Application, °C
Soft Wax Q (Sealing compound)	Unground Joints	10^{-4} at room temp.	30	60
Medium Soft Wax W-40 (Sealing compound)	Unground Joints	10^{-3} at 180°C	30	40 to 50
Medium Hard Wax W-100 (Sealing compound)	Permanent Joints	10^{-3} at 180°C	50	80
Hard Wax W (Sealing compound)	Permanent Joints	10^{-3} at 180°C 10^{-6} at room temp.	80	100

[1] James Biddle & Co., Philadelphia.

TABLE VII

Oils Used As Pumping Fluids in Oil Diffusion Pumps

Commercial Name	Chemical Name	Chemical Formula	Molecular Weight	Specific Gravity 25°C	Ultimate Vacuum, Mm Hg
Apiezon A	Mixture of Hydrocarbons	Refined from Petroleum	.....	0.8735	10^{-5}
Apiezon B	Mixture of Hydrocarbons	Refined from Petroleum	.....	0.871	10^{-6}
	Butyl Phthalate	$C_6H_4(COOC_4H_9)_2$	278.1	1.0465	4×10^{-5}
	Butyl Sebacate	$C_8H_{16}(COOC_4H_9)_2$	314.3	0.933	2×10^{-5}
Amoil	Amyl Phthalate	$C_6H_4(COOC_5H_{11})_2$	306.2	1.0190	7×10^{-6}
Amoil-S	Amyl Sebacate	$C_8H_{16}(COOC_5H_{11})_2$	313.3	0.9251	2×10^{-6}
Octoil	2-Ethyl Hexyl Phthalate	$C_6H_4(COOC_8H_{17})_2$	390.3	0.9796	2×10^{-7}
Octoil-S	2-Ethyl Hexyl Sebacate	$C_8H_{16}(COOC_8H_{17})_2$	426.3	0.9103	5×10^{-8}
Myvane-20	Mixture of Hydrocarbons	Refined from Petroleum	.....	0.853	10^{-6}
Narcoil-10	Mixture of Polychlorinated Biphenyls Corresponding Approximately with Pentachlor Biphenyl.		326.0	1.54	2×10^{-5}
Silicone DC 702	Mixture of Organic-Silicon Molecules		530.0	1.07	$<10^{-5}$
Silicone DC 703	Mixture of Organic-Silicon Molecules		570.0	1.09	$<10^{-5}$
Aroclor 1254	Mixture of Polychlorinated Biphenyls Corresponding Approximately with Pentachlor Biphenyl.		326.0	1.64	2×10^{-5}
Litton Type "C"	Mixture of Hydrocarbons	Refined from Petroleum	.....	0.8735	3×10^{-7}
Eimac Type A	Mixture of Hydrocarbons	Refined from Petroleum	.....	0.877	4×10^{-7}

Machining Stainless Steel

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Tapping and threading of stainless steels, including the various types of tools and methods of grinding them, skiving, shaving and other cutting operations are described. Several examples of tool setups are shown, and tools and lubricants as they apply to machining stainless are discussed.

ONE of the major difficulties in tapping stainless steel is having the chips clog behind the cutting edge, causing the tap to seize and break when the spindle is reversed. This is particularly true in high speed tapping operations. Consequently, two fluted taps, often called chip drivers or gun taps, are employed. The wo fluted tap is ground[8] with a 15° to 20° shear angle and throws the chips forward. Usually, such taps are used on work up to ⅜ in. diam, with standard three or four fluted taps being employed for work of greater diameter.

Tapping follows drilling, and the quality of a tapping operation depends upon the condition of the drilled hole. The type of tap for either open or blind holes as recommended by Carpenter[9] is either the spiral fluted or the straight flute spiral pointed tap. These are desirable when tapping the softer and non-free machining alloys because they provide more adequate chip relief. The spiral pointed tap cannot be used in blind or closed holes unless there is sufficient untapped depth to accommodate the chips. This type of tap cuts with a shearing motion. It has the least amount of resistance in the thrust and the entering angle deflects the chips so that they curl ahead of the tap. This prevents packing in the flutes, a frequent cause of tap breakage, and when backing out the tap there is less danger of roughing the threads.

In tapping austenitic compositions, it may be necessary to select a tap one size larger than ordinarily used for the carbon steels, since the threads tend to swell. Also, in austenitic alloys, threading is usually accomplished in one operation since the material work hardens readily, making a second threading operation difficult. However, where work hardening is not a factor, a two tap operation may be utilized; one for roughing and one for finishing. Where possible, a two tap operation is employed because of the economies in increased tap life. However, properly aligned holders to avoid breakage are important. A floating holder is frequently used where exact alignment is difficult to maintain. It has been reported[9] that tap manufacturers are now making taps with threads ground concentric with the shank so that

The first part of this two part article published in the issue of July 7, p. 83, described the machining characteristics of various grades of stainless, and discussed automatic screw machine tooling, chip breakers, curlers, etc. References 1 to 10 appeared with part 1.—Ed.

they run true. This eliminates the necessity of a floating holder, the objection to which is that a floating tap does not produce consistently accurate or concentric threads, because when pressure is applied to the tap the wobble lets it take hold at a different angle each time. This promotes undue strain, causes oversized holes, and when the tap is reversed it will likely cut when backing out.

Taps must be sharp, and liberal application of cutting fluid is essential. The coolant is more of a lubricant since tapping speeds are not fast enough to cause excessive heating. The lubricant is a means of preventing wear and friction on the tap and reducing power required.

The hook grind, with a 15° angle[6] or a 15° to 20° angle[9] has proved effective in tapping stainless steels. However, where this does not bring satisfactory results, it has been recommended[9] that an interrupted thread tap with an uneven number of flutes be used. Less power is required than in regular tapping procedure. Recommended rake angles[9] are from 8° to 12° and the back relief angle for deep holes is approximately 5°.

The use of self opening die heads of sizes ⅛ in. and up and the solid or acorn type on sizes 3/16 in. and under are the types used in threading stainless. The four main types of self opening die heads with the proper chaser grinds for each grade of stainless tabulated are shown in fig. 7. These angles are approximate and should be used only as a guide in establishing individual practices. The inserted or milled and the hobbed type chaser is used with considerable success; but hook grinds are advantageous in threading austenitic stainless steels. Alesch and Stevens[7] have found that the tangent chaser performs well on stainless steels. These chasers can be ground with steep lip angles that eliminate the built-up edge. Recommended lip angles of 20° to 25° have been successfully used on all grades of stainless steel except the 430 type, which requires angles of approximately 5° to 10°. Carpenter[9] has reported that tangent chasers are employed for close tolerance work, and are adaptable on heavy duty jobs such as Acme threads or long coarse threads. Also, when possible, a 20° throat should be used for National Coarse and National Fine threads. Where the threads do not run into a shoulder, a 15° throat is desirable. Single Acme threads require a 12° throat angle and double Acme a 7° throat angle.

In the hobbed chaser, Alesch and Stevens[7] have found that the maximum lip angle that will perform satisfactorily is 15°. This will thread all types of stainless with the exception of the 430F grade, where a 5° to 10° lip angle is preferred. Where acorn dies are employed, it has been recommended [6] that a hook grind be provided and that the lands be reduced if the die either loads or has excessive pickup.

Slow spindle speeds are necessary in threading. Peripheral speeds of 20 to 40 sfpm[7] are satisfactory for the free machining grades, and 15 to 25 sfpm for other types. It is also customary to utilize both a rough and finish threading operation, removing approximately 0.005 to 0.010 in. in the finishing operation[6] with lapped finished ground chasers.

For reaming, either the straight fluted rose or spiral fluted reamer can be employed, the latter preferred for reaming deep holes. Where the spiral reamer is used, a 30° chamfer is recommended with the tool mounted in a floating holder to assure accurate centering. Also, narrow lands and a secondary lead angle of approximately 2° to 3° is advisable. In reaming austenitic steels ample metal should be left so that the reamer may bite continuously to protect it from rapid wear and failure.

The skiving tool is a tool used most on either single spindle automatics or turret lathes. It is a turning tool used occasionally for forming irregular diameters. This tool can be flat or of dovetail design with a shear angle of 5° to 15°, reducing the cutting pressure as it allows but a small portion of the cutting edge to contact the workpiece at any instant of the stroke. The cutting edge should be ground with a 1° to 2° clearance angle. The skive tool is usually operated at the same speeds and feeds as form tools, removing from 0.005 to 0.010 in. of metal.

The shave tool is used to some extent on the multiple spindle automatics, its use being confined to close tolerance and fine finish work. It is similar to a form tool in that the entire cutting edge contacts the workpiece during cutting. Therefore, its cutting pressures are high, but it can be used with a short stroke.

The swing tool is essentially a swinging arm, one end of which is arranged to hold a blade and the other pivoted for holding the tool in the machine turret. It is versatile, being used for straight turning, taper turning, forming and cutoff. For straight turning, the swing tool is employed in places where a hollow mill or box tool cannot be used, as behind shoulders and where a circular form tool on the cross slide cannot be applied. It is also used where very slender pieces require a long cut.

The swing tool should be fed slowly enough to turn the taper and leave a good finish on one cut. However, where heavy work is required, a roughing operation with a specially designed box tool

TABLE I

Suggested Cutting Speeds for Carbide Tools for Various Hardness Ranges

Work Hardness		Suggested Speed*
R_C	Bhn	Sfpm
65	682	20 to 30
60	601	30 to 50
55	545	50 to 60
51	495	60 to 80
45	427	80 to 100
40	370	100 to 150
35	323	150 to 220
30	276	220 to 200
25	249	300 to 400

* For lower hardnesses, use correspondingly higher speeds. In general, the lower range of suggested speeds should be selected for use with heavier speeds, the higher range for lighter feeds.

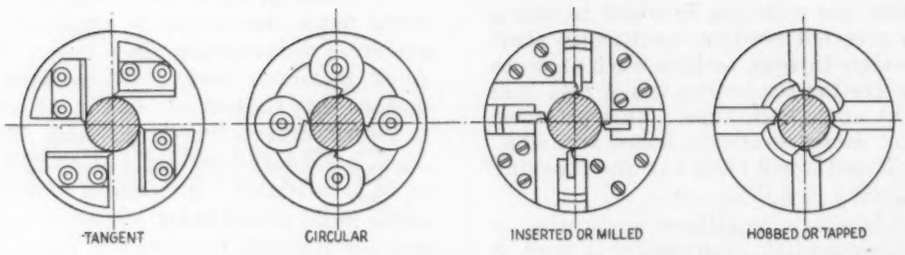


FIG. 7—Various types of thread chasers are shown here. Included also are standard chaser grinds as recommended by Rustless Iron & Steel Div. of Armco Steel Corp.

can precede the swing tool application. The swing tool cut is made without support if the work is sufficiently stiff to prevent springing, but a support or back rest can precede the tool blade. In both forming and cutoff, the swing tool is utilized when the slide positions on the single automatic are already occupied with other forming operations. Swing tools are also used for recessing, internal boring and chamfering.

Of interest is the typical operational steps in forming the stainless steel components by the Brown & Sharpe No. 2 machine, as illustrated in fig. 2 (part I of this article). In the first part, made of 430F, a ferritic alloy composition, the first turret position is reserved for feeding the stock to a stop position so that further forming work can be done. The second turret position spots for the succeeding drilling operation, and the forming operation on a circular form tool begins. Finishing with a circular form tool is completed on the third turret position. Reaming the undersized drill hole occupies the fourth position, and the fifth position chamfers the rear, using a swing recess tool. The last operation is on the slide, and cuts the finished part from the bar.

In the second example, which shows the use of both the balance turning tool and box tool for forming along with the knurling operation, austenitic stainless type 303 is employed. All turret positions are filled and the slide is reserved for the chamfer and cutoff. Because of the work hardening characteristics of this analysis, heavy feeds are taken at slow speeds so that the tool can cut deep enough to get under the work hardened skin. The third example illustrates a form and threading operation. The first turret position feeds the stock to stop, after which the slide position carrying the circular form tool forms the body of the item. A thread chaser is employed on the second turret position while the second slide position performs the chamfering of the succeeding piece and cutoff.

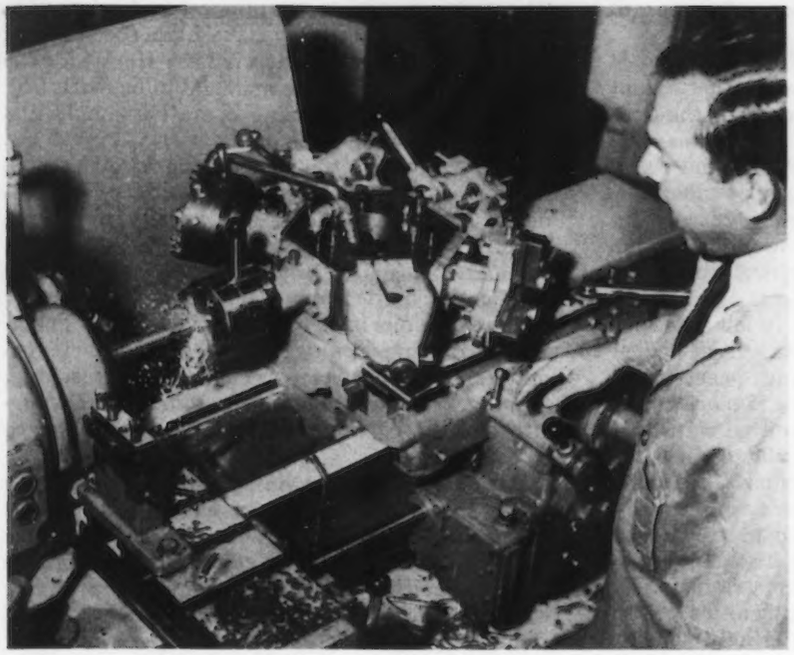
The fourth example in fig. 2 has a deep hole that is drilled in two operations. Thus, after the stock is fed to stop, the second turret position spots for drilling, the third turret position drills to approximately $\frac{5}{8}$ in., and the fourth turret position finishes the drilling. During drilling, the slide position with the circular form tool overlaps. The fifth turret position is reserved for counterboring, after which the second slide position for the cutoff is utilized. The fifth part (fig. 2) is made of 303 stainless. Two turret positions are used for spotting and drilling tools while the circular form tool on the slide position forms the main body of the item from position *a* outward. After completion of forming, the cutoff serves both as a form tool from position *a* inward and as a cutoff tool.

The part shown in fig. 3 is made on a six-spindle New Britain-Gridley. Six turret and four slide positions are utilized. Both rough and finish forming are done with the dovetail type forming tool. The fourth slide position employs the knee tool and the threading is done with milled chasers.

To maintain a high productivity machine, it is not only necessary to select the proper type of tool steel for each operation, but correct grinding techniques must be employed at all times. There is a choice of tool analyses within three major groups; high speed steels, cast alloy compositions, and sintered carbides. The effect of grinding carbides is to produce intense local heating, which is rapidly absorbed by both the surrounding metal and coolant. With the expansion of the steel caused by the heat and rapid cooling, severe strains are developed momentarily in the surface. If a sufficient heavy cut is taken when grinding a hardened tool, small grinding checks or cracks will form on the surface. These are usually accompanied by temper colors. As long as the heat is insufficient to produce this color there should be no danger.

Frequent and proper sharpening of tools and cutters produces accurate work and increases tool life. Dull tools slow up production and sometimes cause failure by breakage. Also, more of the tool has to be ground away to renew the cutting edge. In selecting grinding wheels for tool room work, the proper abrasive, grain, and grade should be chosen so the wheel will grind rapidly without unduly heating the tool. The cut should be light and not forced to avoid drawing the temper from the cutting edge.

In machining straight chromium stainless, the 400 series, difficulty is unusual. Cemented carbides such as used in roughing work and for general purpose applications can be used. The cutting tool design, clearance angles, rake angles, etc., are the same as recommended for general purpose work on either alloy or carbon steels. The feed rate is generally determined by either the finish requirement or the power and rigidity available, and the speed is selected according to the hardness of the material being cut. This relation-



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THE tangent type chaser performs well in threading stainless steels, but should be ground with steep lip angles to eliminate built-up edge. They can be employed for close tolerance work and are adaptable on heavy duty jobs.

o o o

ship, as reported by Kennametal, Inc., is shown in table I.

The austenitic compositions, the 300 series, represent an entirely different problem. Being characteristically gummy, they tend to build up along the cutting edge. The normal correction for buildup is to increase speed, and the austenitic stainless require speeds of from 500 to 800 sfpm at a moderate feed of 0.010 in. per revolution and depth of cut of 0.25 in. Since austenitic steels work harden, the best solution is to machine at low speeds and relatively high feed rates. Since these two characteristics require almost opposite operating conditions, it is recommended that they be run at a speed in the neighborhood of 400 to 600 sfpm with a feed rate in excess of 0.015 in. per stroke or revolution.

This practice helps avoid excessive buildup on the cutting edge and maintains a sufficient feed rate to get under the work hardened surface of the previous cut. If rough and finish cuts are to be taken, a minimum of 1/32 in. of stock and preferably 1/16 in. of stock should be left for the finish cut. As can be expected, tool life averages about half that experienced in machining straight chromium stainless compositions.

Metal to metal contact in machining will produce frictional heat to a degree dependent upon both the material machined and the conditions under which it is machined. The degree of heat depends upon the physical constants present during machining. Thus, such factors as the type of chip, cutting speed, feed, and depth of cut must be considered. All of these factors are altered to some extent as the material to be machined varies.

Attempts to crowd cutting fluids into rigid molds as either coolants or lubricants ignore the complex inter-relationship of these two functions. This dual relationship is especially true in the machining of the stainless steels. Bastian[11] has aptly defined the functions of a cutting fluid.

Mineral lard oils are frequently employed in machining stainless steel, this classification of oils being normally designated "inactive." The percentage of lard oil may vary with the specific formulation as prescribed in an individual plant. There are several distinct disadvantages in the use of this type of cutting fluid besides its relative high cost, these being odor development, rancidity, and susceptibility to bacteria propagation.

[11] *"Metal Cutting Fluids," by E. L. H. Bastian,* THE IRON AGE, *Feb.* 10, 1949, *vol.* 163.
[12] *"Cutting Fluids for Better Machining," published by O. A. Stuart Oil Co., Chicago.*

It is surprising that the mineral-lard mixtures are employed despite their disadvantages. However, when one realizes the influence that the term lard oil has on crtain shopmen, one can realize why it is used. There seems to be a certain psychological magic to the term, undoubtedly the result of both familiarity of the material and established usage. Experience has been that where a substitute mixture containing no lard oil was contemplated, there is a reluctance in acceptance. This reluctance in some cases has been so great that a deliberate camouflage of the drum was necessary before the substitute oil was even tried for evaluation.

The development of sulfurized oils was a major advance not only in cutting oils but in the general field of lubrication as well. Sulfur and many of its compounds tend to affect metal surfaces and prevent their bonding or welding. This quality is useful in cutting oils as it helps prevent tendencies toward welding the chip to the tool, and the consequent scuffing and deterioration of the tool and the finish on the workpiece. Oldacre[12] has found that oils containing active sulfur will prevent seizure between rings on an SAE tester even though the rings become red hot from friction and load. Chlorine, like sulfur, forms a wide range of compounds that will vary widely in usefulness. Its function is not as well established although experience demonstrates that some chlo-

rine containing cutting fluids have definite advantages.

Oils containing active chlorinated compounds will retard the rate of heating and to that extent will prevent welding, but immediately as the temperature reaches a critical level, seizure may result. In tests performed on the Almen and Falex machines, where torque readings are possible, sulfurized oils gave high torque readings with no seizure, while chlorinated oils showed low torque readings and seizures when a critical point was reached.

Most cutting oils are of relatively low viscosity and many operators feel that the light-bodied products are better coolants and penetrators. They pump more freely, their flow is more easily controlled, and there is less carryoff on chips and product with such oils. Yet heavier bodied oils should not be overlooked, particularly for slow speed operations. Very low viscosity oils usually have low flash and fire points and must be used with discretion. Such products also appear to produce greater physiological effects resulting in dermatitis and other irritating difficulties.

The use of soluble oils is increasingly popular where conditions are such that there is little chance of the coolant diluting the lubricant used in the machine. In cases where automatic equipment is used, soluble oil diluted with water is not recommended since dilution of the lubricant in the equipment may result, causing freezing of the machine. This is more a factor when equipment is old and seals are worn. Soluble oils are generally emulsifiable in either cold or warm water, and contain additive agents, wetting agents, rust inhibitors and germicides. Good soluble cutting oils will form stable emulsions that will not separate upon standing and are free of mineral acids. Their advantage over the mineral-lard or straight mineral oils is that they have high specific heat and good thermal conductivity. However, the equipment available, the material to be machined, and the type of machining operation should dictate the type of oil to be used.

With respect to the composition of oil used in machining stainless steels, a definite recommendation is difficult because of a variety of factors, such as equipment, material, tool compositions, etc. The sulfurized mineral-fatty oils have been used in automatic screw machine work; the heavy duty soluble oils have been satisfactory for grinding, boring and turning; and the sulfo-chlorinated mineral fatty oils have been used in broaching, tapping, threading, reaming and drilling. Composition of the cutting oil is not the only factor to be considered.

Best results in machining are obtained when cutting fluid is directed on the workpiece and tool in sufficient volume. Both tool and workpiece should be flooded without splashing, making certain that neither chips nor tool supports interfere with the flow of fluid to the work area. Oils should be constantly checked to assure that their composition does not materially change from the original concentration, either through careless mixing, combination with lubricating oils, evaporation, or other causes.

There is no substitute for experience in machining stainless steels, since this is a determining factor in both tool layout, operational sequence conducive to economical production, feeds and speeds. However, there should be no difficulty provided the characteristics of the material are recognized and proper cutting angles, structural condition of bar stock and other factors are recognized.

Broaching Typewriter Parts

AN interesting solution to finish machining different parts in relation to each other was recently worked out at the Underwood Corp., New York, and Colonial Broach Co., Detroit. In typewriter carriage guides, it is extremely important that the V's on opposite sides line up accurately. To avoid chance of error in assembly, Underwood broaches these V's after assembly; even though one part is cast iron and the other steel.

The metal indicated by the dark area in fig. 1A is removed in the first broaching operation; then the steel bar is attached and the two V's are broached as in fig. 1B. The machine used is a 10-ton, 72 in. stroke Colonial universal horizontal, with the double toothed broach guided the full length of its stroke in the broach towers.

Interesting also is that the broaching fixture is designed to accommodate guides for two sizes of typewriter carriages, one guide being 14 in. and the other 26 in. long. Either size part is held in the fixture by cams, locating plungers and equalizing clamps.

FIG. 1—In order that the V's on opposite sides of a typewriter carriage guide line up accurately they are broached after assembly. The metal indicated by the dark area in fig. 1A is removed in the first broaching operation. Then the steel bar is attached and the two V's in fig. 1B are broached.

New Production Ideas . . .

Machines for cone rolling, spring coiling, thread rolling, and pipe threading are described in this issue, together with a wheel forming attachment, motorized centers, a fixed center drill head, flange punch tools, magnetic perforating dies, thrust bearings, self-locking hex nuts, cranes and an overload hoist-crane switch, dolly trucks, and a velocity-power driver.

CONES, funnels and other sheet metal conical shapes can be formed on a new cone rolling machine. The machine will handle

practically any range of conical work up to 45° included angle with a sheet 36 in. wide. It is built with three removable cone shaped mandrels arranged in a pyramid form and adjustable for angularity and center spacing of rollers. Cantilever design is used on the main forming rolls, eliminating the necessity of outboard bearings and thus permitting forming of cones practically to a point at the small end. Cones within a given range of taper may be formed by making adjustments only on the angle or spacing of the rollers. Major changes in taper of work necessitates a change in rollers that can be made rapidly by the removal of a single clamping bolt on each roll. Rolls are independently driven and adjustable. The rotating power for forming is provided by three motors, one driving each roll, controlled by a common single push button station. The machine is of welded construction. The full universal adjustment that can be obtained on the machine permits its use on a number of other operations. By placing the lower rolls parallel to one another the same results can be obtained as on any open end forming machine. *Reed Engineering Co. For more information, check No.* 1 *on the attached postcard.*

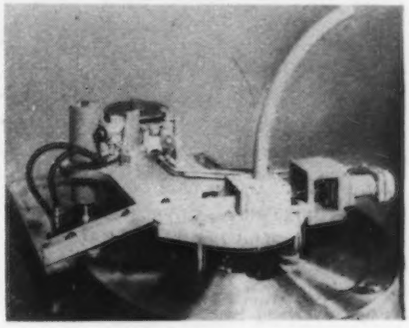
Wheel Forming Attachment

FORM grinding in hardened steel to 0.0001 in. accuracy is possible with a single, lightweight, portable instrument, known as the Diaform Wheel Forming Attachment. It is said to produce accurate split dies, punches and flat forming tools from

solid, hardened steel on horizontal spindle surface grinders, in hours instead of days. The instrument traces from templates and form dresses wheels to tenths by means of a dressing diamond. It operates on the pantograph principle, tracing from a 10:1 ratio template. The major portions of the Diaform are of aluminum alloy so that it is easily portable. The attachment will form dress to a depth of ½ in. on wheels up to 10 in. diam and 1 in. wide. The diamond is chisel-shaped and is mounted to rock about the center of a small radius on its tip so that it always dresses the wheel at the proper position as it is moved across the face of the wheel under control of the tracer and template. *Pratt & Whitney, Div. Niles-Bement-Pond Co. For more information, check No.* 2 *on the attached postcard.*

Thread Rolling Machine

ROLLING pipe threads with a new cylindrical-die thread roller provides a method of producing round plugs and fittings from steels, brass, bronze and aluminum, with uniform, smooth and accurate forms. The thread form with a burnished finish is obtained through the use of three cylindrical dies. The work blank is supported and positioned between these three synchronously rotating dies, which simultaneously hold the blank rigidly in proper position and roll the thread. The dies always remain in match during rolling. The feed is by cam-actuated toggles that insure definite and controlled rate of penetration, predetermined length of dwell and positive duplication of



size. Control of dimensions is accomplished by positive adjustments for diameter, length and taper. Setup and changing from one job to another is quick and does not require a highly skilled setup man. Model A22 and A23 machines may be supplied with manual or semi-automatic feed suitable for rolling 1/16 to 2-in. pipe threads from 300

to 1500 per hr. *Reed Rolled Thread Die Co. For more information, check No. 3 on the attached postcard.*

Roll Turning Tool

A MECHANICALLY-HELD roll turning tool for use in longitudinal feed lathes has a square nose, and is set at an angle in the tool post to allow for the desired depth of cut. A solid Kennametal blade is clamp-held on the supporting shank with an advanceable back-up plate. The blade has four cutting edges that may be used in succession before sharpening is required. The tool is available in sizes 2½ in. wide x 1 7/8 in. high x 15 in. long and 2½ in. square x 15 in. long. *Kennametal Inc. For more information, check No. 4 on the attached postcard.*

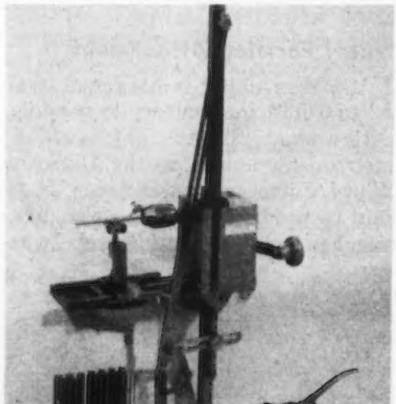
Motorized Centers

FLAT, curved or circular work and straight, taper and contour outlines can be set up for grinding with a new attachment called Motorized Centers. It provides also for indexing. Motorized Centers consists of a rocking bed that will swing 20° to either side of horizontal and when used with an angle plate, the maximum taper angle be-

comes 30°. Upon this bed is clamped the base plate, dovetailed to permit sliding the head- and tailstocks to position. The headstock is equipped with a live center and index plate with 24 holes, jig drilled to a tolerance of ±0.001 in. for spacing. The overall length of the new tool is 12 in. x 10 in. wide including the motor. Height is 8 in., distance between centers 6 in., and it will swing 6 in. Equipped with a 1/25 hp motor, the complete unit weighs 34 lb. All steps can be accomplished with the same setup, since tapers can be reversed or changed by loosening two screws in the rocking bed, and the indexing plate can be engaged by pressing a plunger. The attachment can be used on surface grinders, jig borers, jig grinders, drill presses, light milling machines and as an inspection tool. *Moore Special Tool Co. For more information, check No. 5 on the attached postcard.*

Spring Coiling Machine

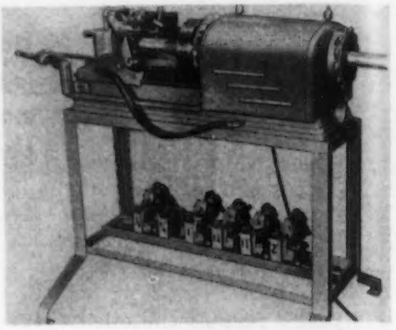
A SEMI-AUTOMATIC machine for winding left- and right-hand compression, extension and torsion springs handles wire diameters up to 0.063 in. and will coil springs up to ¾ in. diam. Springs up to 4 in. long and up to 25 coils can be produced, and pitches are adjustable. The end coils of compres-



sion springs are closed or squared automatically, and the springs are wound with a uniform pitch and to exact length. Springs may be wound from spring steel, music wire, stainless steel, phosphor bronze or any other spring material. The machine is hand operated but a motorized unit can be added. It comes equipped with an arbor rack, containing 29 arbors made from ground, polished and hardened drill rods in sizes from 1/16 to ½ in. diam advancing by 64ths. *Carlson Co. For more information, check No. 6 on the attached postcard.*

Pipe Threading Machine

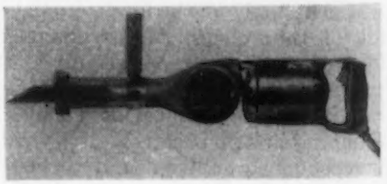
A NEW triple purpose, portable machine for cutting, reaming and threading pipes up to 2 in. diam and threading solid rounds up to 1½ in. diam features a new type Roto-Lok wrenchless chuck. It will rapidly chuck and unchuck work as the spindle rotates. Pipes, solid rounds, and bolts are quickly centered and rigidly held. The wrenchless chuck may be used for right or left hand rotation. Pipe diameters ⅛ to 2 in. and bolt di-



ameters ⅜ to 1½ in. can be placed through the rear centering unit and the Roto-Lok chuck. Turning the handwheel of the chuck locks the pipe in position. Cutting speed for the machine is automatically kept constant for any diameter pipe by a special high speed, universal geared-type motor designed with a power curve that adjusts itself in speed to the size pipe and type of thread being cut. All die heads used on the Threadfast machine are free floating units that permit immediate and correct chaser contact. *Peerless Machine Co. For more information, check No. 7 on the attached postcard.*

Gun Type Saw

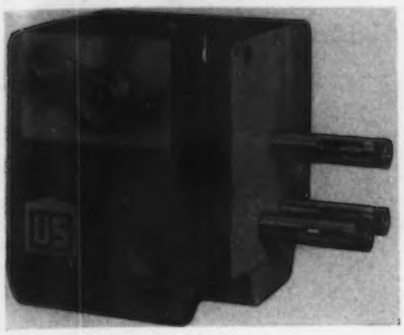
A NEWLY developed reciprocal gun type saw will cut through any material from rubber to stainless steel. The stroke is adjustable up to 2 in. Special guides for various blade widths, from ½ to 1 in., eliminate whipping or snapping of the blades. These guides are also used as sights in following a line. The handle can be moved in any position to ease arm fatigue of the user when cutting at various angles.



The unit will swivel 360° and lock in any cutting tangent. Concentration of power on the cutting stroke is by gear arrangement. The saw can be driven by an electric drill, an air drill, or a flexible shaft. *Transa, Inc. For more information, check No. 8 on the attached postcard.*

Fixed Center Drill Head

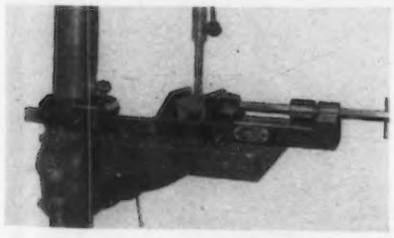
THIS multiple spindle drill head was built to permit the machining of different materials at cor-



rect peripheral speeds from a single drive unit on tools such as drills, taps and reamers. The head is oil-lubricated so that it can be operated at high speeds. Maximum speed recommended is 15,000 rpm. Gears of heat-treated high carbon alloy steel are of helical type for noiseless operation and have a small helix angle to keep end thrust at a minimum. The speed of spindles is changed by means of sliding type gears, done by rotating the head lever 180°. The gears are locked in place by a spring-operated plunger. The head can be built using any number of spindles to cover any area and can be used on any kind of mounting. *U. S. Drill Head Co. For more information, check No.* 9 *on the attached postcard.*

Vise for Drill Presses

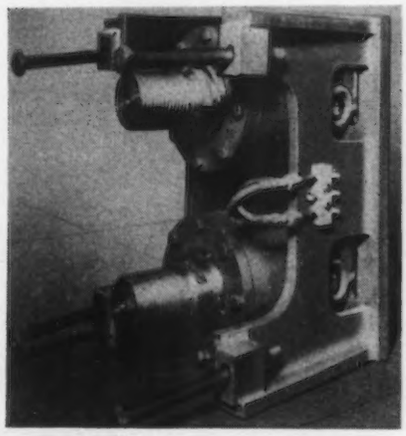
BECAUSE a single turn of the handle frees the jaws for push-pull opening or closing, the new Col-Vise saves time on typical drill press operations. It often saves the time and cost of making simple jigs and fixtures. The universal Col-



Vise clamps to the drill press column; position of the vise is adjustable angularly and radially; and the entire device can be swung clear. The vise has 1½ x 4-in. jaws and a maximum opening of 6 in. Models to fit drill presses with either stationary or movable tables are available. Column diameters of 1 7/16 in. through 3 29/32 in. can be accommodated. By removing the column connection, the vise can be used as a quick-acting machine vise. *Universal Vise & Tool Co. For more information, check No.* 10 *on the attached postcard.*

Thrust Bearing

AN end-thrust bearing has been designed to work with conventional plain radial bearings on rod or bar mills. The bearing is available as a separately-attachable unit for easy installation on any mill stand where one end of the rolls is open. It is said to allow precision control over axial matching of roll



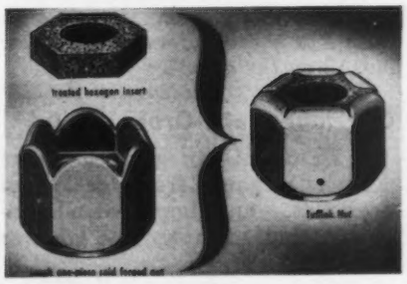
passes. Among the advantages claimed for the unit are: Elimination of conventional wearing-type side thrust collars; ease and accuracy of adjustment; permanence of roll grooves location after adjustment; long service life of anti-friction bearing elements; increased life of roll grooves and guides; and increased mill tonnage, better yield and more accurate tolerances. Operating and maintenance economies are claimed because of reduction in electrical load on the mill motor. The new bearing features a cartridge containing a double direction anti-friction thrust bearing mounted on a pin that fastens to and rotates with the roll. An outer casing bolted permanently to the roll housing encloses these roll-controlling cartridges, and by means of a simple threaded push-pull device, allows for the lengthwise adjustment of each roll and for its locking in position after groove matching. *Mackintosh-Hemphill Co. For more information, check No.* 11 *on the attached postcard.*

Magnetic Perforating Dies

MAKING up die sets for the piercing of holes in materials up to ⅛ in. mild sheet steel is speeded up by assembling magnetic perforating punches and dies in a template mounting plate. On completion of any job, the punches and dies, with their retainers, are removable and ready for use in a new arrangement. Only the two templates are then stored, for use in duplicating the original job at any time. Standard sizes of punches, dies, bushings and retainers are available for perforating round, oval, square or rectangular holes from 1/32 to 3-in. diam. Tolerances in perforating can be held to 0.0005 in. or as close as can be jig bored. Die sets can be made up in any size. *S. B. Whistler & Sons. For more information, check No.* 12 *on the attached postcard.*

Self-Locking Hex Nut

A NEW self-locking hex nut features a hexagonal locking insert to prevent it from rotating within the nut and to assure a tight grip at all times. The insert is chemically treated to resist both absorption of moisture and drying out. Cold forging adds extra strength to the nut body and in combination with the tough insert provides an extremely tough nut, said to give performance in excess of Army-Navy requirements for

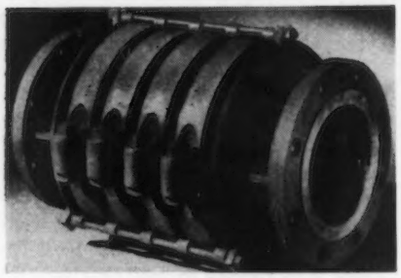


aircraft fasteners. This Tufflok Nut is available in sizes 4 through ⅜ in. *Townsend Co. For more information, check No.* 13 *on the attached postcard.*

Packless Expansion Joint

THE Corruflex expansion joint designed to absorb expansion and contraction caused by temperature changes in steam, liquid and gas pipe lines, requires no packing and is suited for use in remote and difficult-to-service location. Corruflex is available in sizes from 3 to 24 in., with single or multiple cor-

rugations, with or without self-equalizing rings, single or double units, and with either flanged or welding ends. It is supplied in copper, stainless steel or other alloys, and with internal sleeves if required. The traverse of the Corru-



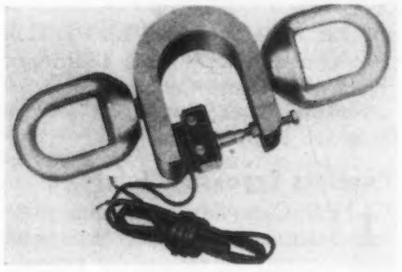
flex joint ranges from fractions of an inch to 15 in. and will operate under pressures from vacuum to 300 lb and temperatures from subzero to 1600°F. *American District Steam Co. For more information, check No.* 14 *on the attached postcard.*

Chain Coupling Covers

PLASTIC covers for chain couplings are molded of rag-filled phenolic plastic for maximum strength with minimum weight. The plastic used is resistant to practically all acids and alkalies. Covers are streamlined for safety, provide sealed-in lubrication and maximum protection. Two-piece construction with slot head screws requiring only a screwdriver permits easy installation. *Morse Chain Co. For more information, check No.* 15 *on the attached postcard.*

Overload Hoist-Crane Switch

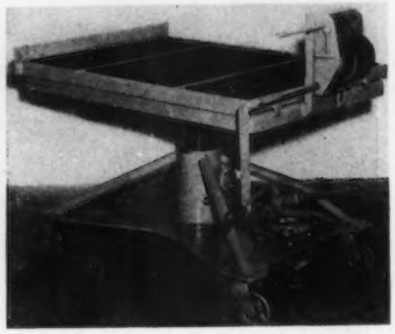
DESIGNED to protect hoists or cranes from accidental overloads, an improved Dyna-Switch that slips onto the hoist or



crane hook, consists of a U shaped tool steel bar that opens and closes the circuit of a micro-switch as loads are lifted. Normally, the circuit of the micro-switch is closed when loads are being lifted. If the hoist capacity is exceeded, the load automatically opens the circuit cutting out the motor and preventing the lift. The circuit remains open until the operator presses the switch to reverse. Excess load must be removed before the hoist will pick up. Hoist motors up to ¾ hp can be handled directly by the Dyna-Switch. All higher capacities are worked through an intermediate relay. *W. C. Dillon & Co., Inc. For more information, check No.* 16 *on the attached postcard.*

Hydraulic Die Table

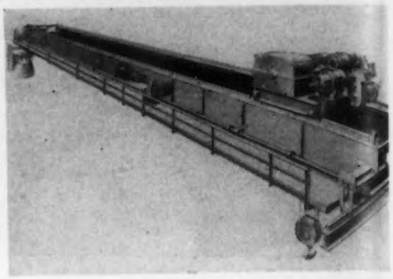
FEATURES of a special hydraulic die table with a 31 x 42 in. table having 13 rollers set on 3-in. centers are the additions of a roller top and winch. A single removable retaining bar prevents dies from rolling off the open end of the table. To pull dies from presses and storage racks, a 35:1 ratio hand winch is furnished with 15 ft of steel cable.



The table elevates from a lowered position of 22 in. to an elevated height of 30 in. A single speed foot pump enables an operator to position dies weighing as much as a ton. A floor lock holds the table in position for die transfer work. *Lyon-Raymond Corp. For more information, check No.* 17 *on the attached postcard.*

Improved Cranes

THREE innovations on Whiting cranes are the streamlined, full-vision cab, simplified magnetic controllers and fluid-drive on both bridge and trolley motors. The full-vision cab provides maximum ease and comfort for the operator with the widest possible range of vision. By moving short, fingertip levers, the operator, in a comfortable, nonfatiguing, seated position, controls all crane motions. Using magnetic controllers, only low voltage is run into the cab and the use of cumbersome drum-type controllers is eliminated. Hydraulic couplings are used on both bridge and trolley drives, permitting the use of simple, inexpensive electric motors and resulting in faster pick-up and quicker braking. With fluid drive, sudden reversal of motors is not



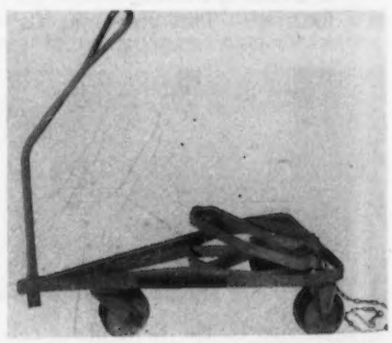
harmful nor dangerous. *Whiting Corp. For more information, check No.* 18 *on the attached postcard.*

Swing Check Valve

A NEW swing check valve, said to be effective and dependable for cold blast lines of blast furnaces, is installed in the cold blast line between the blowing room and the mixer line connection. The valve acts instantly and automatically to prevent reverse flow in the event of blast failure. It is a fully-enclosed non-return valve of the swing disk type, the floating disk hinging on an extra-shaft that extends through corrosion-proof packing glands in the valve body. It is supported in outside-mounted roller bearings. *William M. Bailey Co. For more information, check No.* 19 *on the attached postcard.*

Twin Dolly Truck

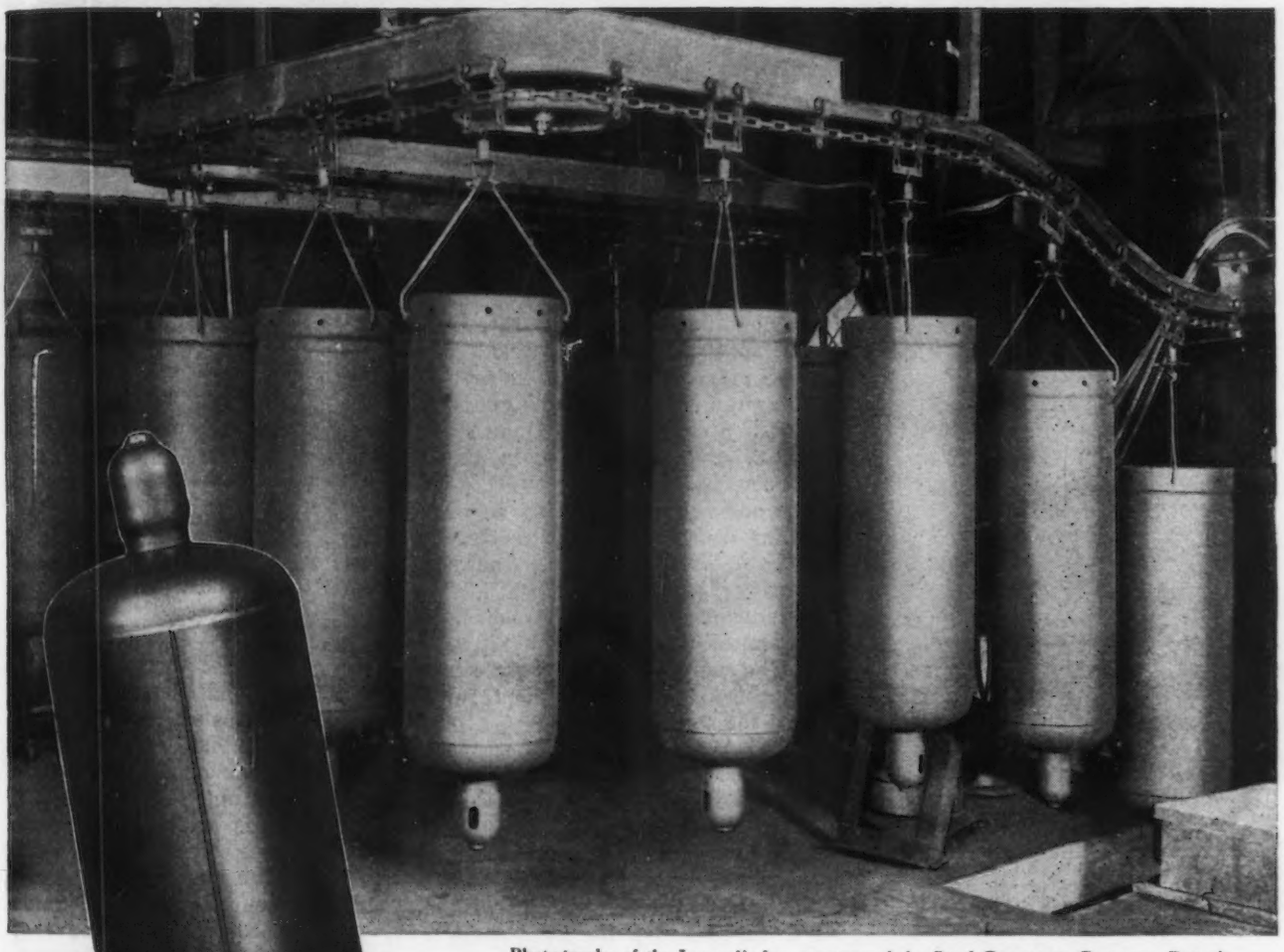
FIVE tons of long strip steel, pipe, etc., can be handled by two men with two of the new three-



wheel dollies, hitched in tandem. Both ends of a load can extend as much as 5 ft beyond each dolly, and sharp corners can be turned easily in restricted space. A strong, adjustable steel chain attaches to the

N-A-X HIGH-TENSILE STEEL in L.P.G. Cylinders

means light weight with added safety and durability



Photographs of the Lee cylinder, courtesy of the Steel Cooperage Company, Detroit.

Because of the greater strength and excellent fabricating, welding and copper brazing properties of this low-alloy, abrasion- and corrosion-resisting steel, cylinders made with it (to conform to I.C.C. safety requirements) are 35% lighter in weight than when made with conventional carbon steel.

This weight reduction (with longer life) means greatly reduced shipping and handling costs . . . and over-all savings to consumers.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N·A·X
HIGH-TENSILE STEEL

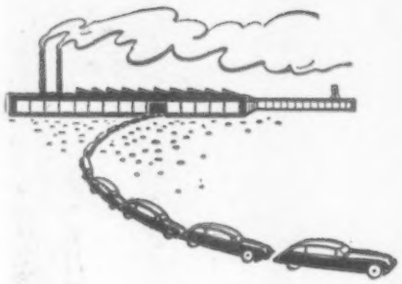
GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

Assembly Line . . .

WALTER G. PATTON

• 1949 wage pattern is at stake in the Ford-UAW-CIO negotiations . . . Replacement market of the auto industry running far ahead of prewar level.



DETROIT—There may not be a second strike at Ford Motor Co. this year but finding a formula that will avoid a strike is going to be difficult. An "out" for either side is not evident at the moment.

At the present time Ford is far out in front in the 1949 wage pattern sweepstakes. According to local labor experts, the only ingredient missing from the strike picture today is the buildup by the union that always accompanies a UAW-CIO walkout.

When steel got a 60-day reprieve recently as a result of some fast maneuvering by President Truman and Philip Murray, a Ford strike baby was deposited on Walter Reuther's doorstep for the second time this year. Despite vigorous protests by Mr. Reuther to the contrary, most local observers feel the first Ford strike was an unwanted child. Now, with his strike sword blunted by the earlier Ford stoppage, Mr. Reuther will have to pick up the latest Ford strike baby. Somehow he will have to nurture it —with pensions, insurance benefits or wages. The company promises no food for the infant while Mr. Reuther is demanding an exceedingly rich diet valued, by some of the experts, at 47¢ an hr, including pensions, insurance and a wage increase.

Few people envy Mr. Reuther his present job. However, it is confidently expected that he will come riding high into the middle of the Ford negotiations, perhaps 15 min before some great crisis. Whether he will ride off with a strike or a settlement is still anybody's guess. Up to the present time, Mr. Reuther has taken no active part in the negotiations.

One question that is being asked here is: Will government arbitration be accepted? No one knows the answer, of course, but past history indicates that Ford would oppose almost any form of arbitration. The company is almost certain to oppose arbitration in the form offered the steel companies.

ANOTHER way to avoid a Ford strike is the possibility that Mr. Reuther and Mr. Murray, working together, might agree that a better pattern can be worked out with the steel companies than with Ford. In that case, the Ford negotiations would be stalled, it is argued, and steel would have to set the 1949 wage pattern after all.

Most observers feel this latter theory is somewhat remote. They anticipate some spirited negotiations between Ford and the union within the next few weeks. Then somebody will find reasonable ground for compromise or Ford strike No. 2 for 1949 will be on.

Statements from Milwaukee that Walter Reuther and Philip Murray of the CIO are working very closely together are not being accepted here at full value. It is pointed out that in the past Walter Reuther has always taken off for himself if any objective lay directly ahead. There is not much reason to believe he will follow a different course at this particular time.

In the present situation it should be pointed out that Mr. Reuther has the UAW-CIO tighter in his grasp than at any previous time. Committees and officers are closely held. The only anti-Reuther members of the international board did not even run for reelection in Milwaukee. For the first time, Walter Reuther has no opposition to face from his own union officers. If opposition to his leadership develops it will have to come from the rank and file of the membership. However, any Reuther-controlled union is usually so well organized that opposition from the membership, while often vocal, has only limited effectiveness.

For example, at the recent convention, the union slate advocating higher dues, a convention every other year and increased power of the international over the locals had rough going for a while in open session. However, by arranging for a slight delay, Walter Reuther was able to get just about what he wanted from the membership.

IN the case of Ford, there are also some new conditions to consider. Most observes agree that Henry Ford II has made a sincere effort to implement his so-called "human engineering" program. Ford Motor Co. is a vastly different place to work than it was a few years ago. The fact remains, however, that union leaders—not necessarily the rank and file—have opposed many of the Ford moves.

The recent Ford strike over

Strike Delayed

Detroit

. . . Delay of a Ford strike for at least 2 weeks became a certainty last week when the union, in a surprise move, asked for a state-conducted secret strike vote under Michigan's Bonine-Tripp Act. Among the reasons advanced for the change in the union attitude are: (1) The union will have more time to "build up" the strike; (2) the Michigan Supreme Court has held the union's defiance of the act last year was unconstitutional; (3) on request of either party—the latest Ford offer must be printed on the ballot. To date, Ford has made no offer to the union.

ANOTHER P&W ECONOMY FEATURE

"Pilot" principle — chamfer and groove at end of Gage — permits easy entry (see drawing), even with unskilled operators. Saves time and lost motion. Available on any P&W Cylindrical Plug Gage.

GAGE

THE P&W WAY...

and cut down on Gage Replacement

When you've put Pratt & Whitney Cylindrical and Thread Gages to work, you'll know what we mean by long-wear-life. This feature . . . characteristic of every Gage produced at Accuracy Headquarters . . . is achieved (1) by lapping to provide maximum wear areas, and (2) by strict adherence to precision standards, from design right through every manufacturing phase to final inspection in our large constant temperature rooms.

P&W Cylindrical and Thread Gages are often accepted confidently as delivered without further inspection — a tribute to P&W perfection.

Ask for complete detailed literature on any of the types of gages illustrated, or for our Gage Catalog No. 11, which contains complete listings of all P&W Precision Gages.

Pratt & Whitney

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

THREAD and CYLINDRICAL GAGES

speedup was openly branded a political move by Ford top management. The kicking around the company took during the strike, both financially and otherwise, has not helped Ford-union relations. Henry Ford II has taken every opportunity to let Mr. Reuther know that Mr. Bugas is boss of the Ford negotiating team. He has made no public effort to enter the negotiations with the union. The possibility that personal talks between Henry Ford II and Walter Reuther might be arranged to settle the strike issue has been all but written off by most local observers.

The next few weeks will be the crucial period in the Ford-UAW-CIO relationship. A 1949 wage pattern hangs in the balance. What Ford and the union do—or chose not to do—will undoubtedly have a very important effect on the existing U. S. labor problem. Should Ford agree to a pension plan in which the company agrees to pay the entire cost it will be embarking on a program the automobile industry has consistently opposed. In auto management's eyes this has always been paternalism — something that was not wanted by either management or the worker.

College-Trained Men For The Automobile Industry

Detroit

• • • **In contrast** to its earlier years, college-trained men are playing an increasingly important role in the automobile industry.

General Motors alone expects to hire about 400 college graduates this year. About 340 of these graduates will come from engineering schools. GM is looking particularly for men trained in production control, product design, tool engineering, processing methods and research, it is reported.

Most of these men have already been selected by members of the GM staff who regularly visit 75 colleges yearly. Detailed records of interviews are kept and these records are made available to each GM division.

Ford has a 2-year course for graduates called the Ford Field Training Program. The men attend classes 8 hr each day and are introduced to both technical and nontechnical problems of the automobile business. Nearly 50 men are graduated each year to Ford's "talent pool."

Chrysler selects 40 to 50 engineering graduates each year for enrollment in the company's own post graduate engineering school. These men are paid while training and receive a master's degree in engineering on completion of the course.

GM Proving Ground Employees Kept Busy

Detroit

• • • **General Motors** really works at decentralization. It is common knowledge in Detroit that the corporation's efforts to keep its vast organization decentralized and competitive are as ingenious as they are successful.

This was brought out emphatically at the GM proving grounds last week when Buick gave the press a preview of the new Buick Special which is to be introduced Aug. 8 to the public. For example, on the 1268 acres owned by GM at Milford, drivers put cars over highways at the unheard of rate of 25 to 30,000 miles per day. This goes on winter and summer, day and night.

The ingenious part about the GM testing arrangement, however, is that there are really two sets of drivers who, in reality, are competing against one another.

To illustrate, each GM car division has its own drivers who use the GM proving ground facilities and actually pay a fee for doing so. These drivers operate directly under the car divisions. After the new cars are put through their paces, they are usually given coast-to-coast runs before being introduced to the public.

Meanwhile the new cars — together with the cars of GM's competition — are put through their paces by the GM proving ground crew. The results of all tests are then turned over to GM top management.

Thus, GM in reality regularly insists upon an independent audit of its own cars as well as those of its competitors. The Proving Ground makes this audit.

This is another reason why GM continues to be one of the most progressive companies in the auto industry even while it remains the biggest producer.

ALL STEEL CONVERTIBLE: *Utilizing an all-steel safety top but incorporating all the style appeal of the convertible, the new Buick Riviera has gone into production at Flint. Other GM divisions have announced similar models. Windows are push-button controlled and the familiar center post has been removed entirely. Dynaflow transmissions are standard on all Riviera models.*

Crosley's New "Hotshot" Is a Roadster or Racer

Cincinnati

• • • **A car that** will deliver anywhere in the United States for less than $1000, not including local taxes, has been introduced by Crosley Motors, Inc.

The new Crosley "Hotshot" model is a swank roadster which doubles as a racer. The car is extremely low-slung and is powered by a Crosley 44 cu. in. engine with an overhead camshaft. The engine uses a cast iron block.

The car is equipped with airplane-type hydraulic brakes, combined leaf and coil spring rear suspension, strut-type hydraulic shock absorbers and a removable panel on top of the bonnet which provides access to the engine.

Washington . . .

EUGENE J. HARDY

• USW and other unions facing monopoly probe . . . Bill analysis indicates numerous jokers . . . New isotope program limited to U.S.

WASHINGTON — Phil Murray's difficulties with steel management over current contract negotiations may pale into insignificance during the next couple of weeks, for it is almost certain that Mr. Murray and other USW officials will soon find themselves faced with congressional investigation of alleged labor monopoly in the steel industry.

After ducking this thorny issue for many years, a Senate committee has taken the labor monopoly bull by the horns. Senator Robertson, D., Va., opened public hearings this week and heard testimony from Harry M. Moses, president, H. C. Frick Coke Co., and other coal management officials on the extent to which the United Mine Workers hold monopoly power in that industry. The investigation was prompted by the one-man technique employed in contract negotiations in the coal industry, the 3-day week decreed by John L. Lewis, the threatened steel strike, and the Hawaiian shipping strike, according to Senator Robertson.

The Virginia legislator says the aim of his investigation is to "find out the extent of power which industry-wide labor organization has acquired, the manner in which this power is being exercised, the effects on banking and credit policies, small business enterprises, consumers, prices and national economic stabilization of the economic power of unions in the coal industry and in industry generally."

Because some representatives of management have expressed reluctance to testify voluntarily on such a controversial issue, Senator Robertson may subpoena certain management officials. He did not say if steel company officials are in this "reluctant" category, but this is considered likely in view of the current status of the wage and pension dispute in the steel industry.

Also scheduled to appear at this week's hearings are George H. Love, Pittsburgh Consolidated Coal Co.; John D. Battle, National Coal Assn.; Leo Wolman, Columbia University; Harold Metz, Brookings Institution; Thurman Arnold, former Assistant Attorney General in charge of antitrust matters; and Lewis Haney, New York University.

* * *

USING the welfare-state approach to the problems of high level employment, backers of the Economic Expansion Act of 1949, led by Senator Murray, D., Mont., have introduced the final version of this controversial measure involving some $15 billion in federal funds. This pump-priming measure differs from earlier versions (THE IRON AGE, June 30, p. 76) in only two important respects—it makes no provision for controls or for construction of plants by the federal government.

In introducing the measure, however, Senator Murray stated: "I, for one, still agree with the President of the United States that where no other actions will serve to expand capacity in areas where big business and monopoly insist upon restricting capacity, it may be necessary for the government to engage in direct construction. However, it is my sincere hope that enlightened business leadership can prove conclusively that there is no need for government action of this type. The provisions of the Economic Expansion Bill dealing with accelerated amortization, more liberal credit facilities, the combating of monopolistic restrictions, and the expansion of foreign investment should provide all the incentives that private businessmen could reasonably seek."

Nonetheless, the measure still contains all of the earlier provisions which would put the government permanently into the business of pouring taxpayers' funds into the national economy. Its proponents claim that it is in line with the President's recent economic report (THE IRON AGE, July 21, p. 112), but Senator Murray was careful to state that the bill was not introduced at the request of the Administration. He further admitted that the bill was designed to "carry the program a little further than the President has specifically recommended."

* * *

THE stated objectives of the measure are to insure an average annual increase of 3 to 4 pct in total national output, to provide 500,000 to 750,000 new jobs a year and over the next 4 to 5 years raise national output to $300 billion.

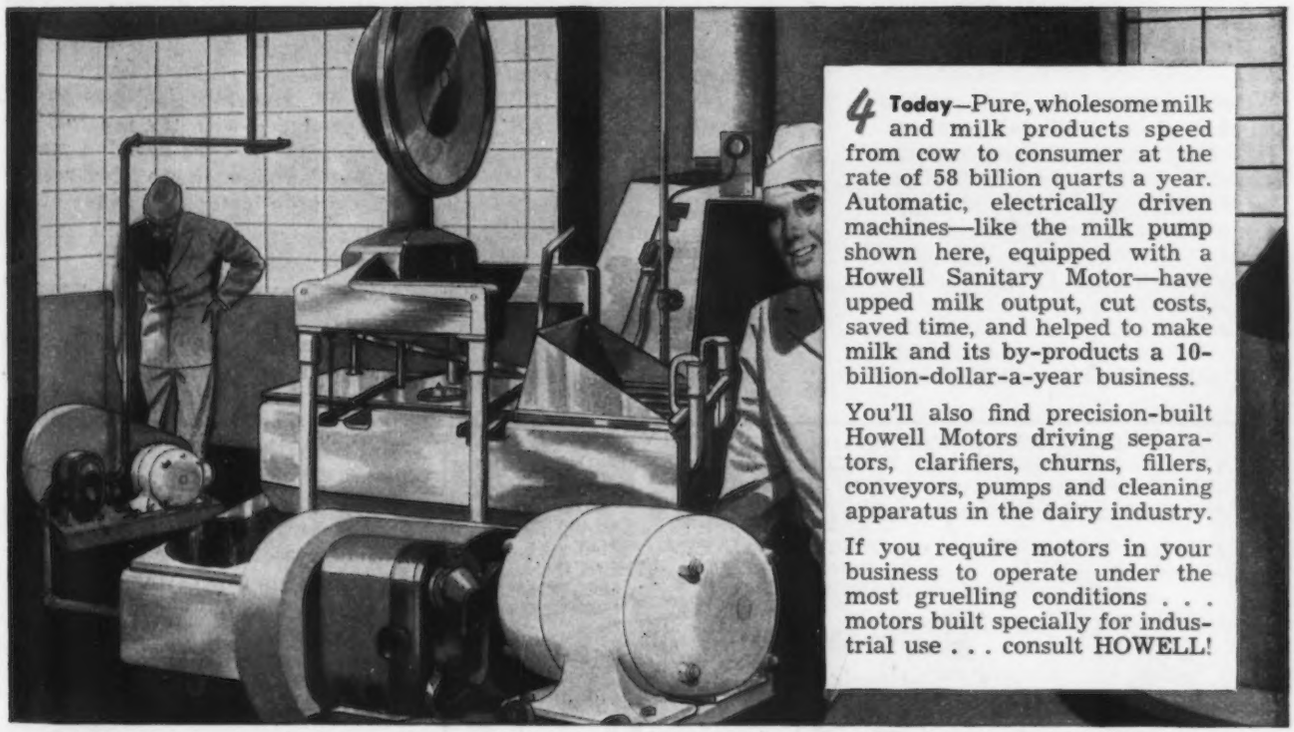
Introduced in the Senate by 17 liberal members, 15 Democrats and 2 Republicans, this huge spending program, which would inject the federal government deeper into the affairs of business, will probably not even get to the hearing stage during the current session of Congress. In fact, some of the provisions, such as extension of veterans benefits and advance public works planning, are now being considered in separate measures.

1 **1770**—Improvement of livestock by selective breeding boosted milk output . . . encouraged dairy farming. City folk now began to sample this wonderful beverage. But harmful bacteria in milk caused sickness, spread disease.

2 **1864**—France's Louis Pasteur won world acclaim by discovering how to rid milk of impurities. Milk soon became an important source of food. Vitally needed was electrical horsepower to speed it from farm to consumer.

3 **1915**—The year Howell Electric Motors arrived also marked the widespread use of the automatic rotary bottle filler and capper in the dairy industry. Soon, these rugged, industrial type motors were widely sought in many industries.

MILK . . . 58 BILLION QUARTS ANNUALLY!



4 **Today**—Pure, wholesome milk and milk products speed from cow to consumer at the rate of 58 billion quarts a year. Automatic, electrically driven machines—like the milk pump shown here, equipped with a Howell Sanitary Motor—have upped milk output, cut costs, saved time, and helped to make milk and its by-products a 10-billion-dollar-a-year business.

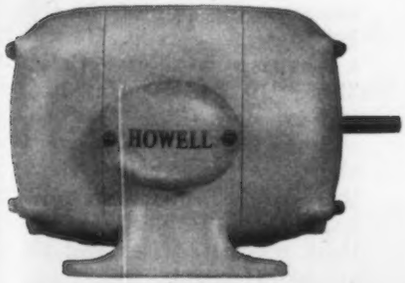
You'll also find precision-built Howell Motors driving separators, clarifiers, churns, fillers, conveyors, pumps and cleaning apparatus in the dairy industry.

If you require motors in your business to operate under the most gruelling conditions . . . motors built specially for industrial use . . . consult HOWELL!

Free enterprise encourages mass production, supplies more jobs — provides more goods for more people at less cost.

SANITARY MOTOR

For dairy and food processing industries. Complies with latest 3-A Sanitary Specifications.



HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

Despite its high-sounding aims, the bill is liberally sprinkled with jokers. For example, the provisions pertaining to the 5-year accelerated amortization and liberal credit to business can be used as a club to force business into line, since the measure authorizes the President to suspend these provisions "entirely or as to specific major industries." Then, too, in every case where business might benefit from the provisions of the bill, the same benefits are extended to nontaxpaying cooperatives.

But, perhaps, most important is the fact that while its sponsors claim that it would result in an ever-expanding economy, they are apparently not too sure of this, since they were careful to insert a provision calling for the expenditure of additional billions to meet unemployment.

On the House side, the bill was introduced by Representative Wright Patman, D., Tex., and a number of other liberal members. Mr. Patman, realizing that the measure could not win a popularity prize, split the Senate version into two parts, carefully segregating all features pertaining to taxes in a separate package. If this had not been done, the bill would have gone to the powerful House Ways and Means Committee, which is more interested in balancing the budget than in spending additional billions for socialistic experiments, where it would have been shelved. As it stands now, Mr. Patman will eventually be able to force hearings on the nontax portion before the House Banking Committee.

* * *

CYCLOTRON-PRODUCED radioisotope tracers will be made available to research workers under a new program announced this week by the Atomic Energy Commission, but distribution of these isotopes will be limited to the "United States and its territories and possessions."

Isotopes produced in the atomic pile, as distinguished from those produced in atom smashing cyclotrons, have been distributed to foreign countries resulting in severe criticism of this AEC policy from some congressional quarters.

The new program will supplement the present distribution of reactor-produced radioisotopes which has been in effect since August 1946. Up to the present, 6975 shipments of radioisotopes of nearly 60 elements representing nearly 100 isotopic species have been made available for research purposes.

Only those cyclotron-produced isotopes having half-lives (the period in which the isotope loses 50 pct of its effectiveness) of more than 30 days will be distributed initially. Included are 43-day beryllium 7, 3-year sodium 22, 44-day iron 59, 4-year iron 55, 250-day zinc 65, 90-day arsenic 93, and 56-day iodine 125. Other cyclotron-produced radioisotopes of significant value may be added at a later date.

In announcing the new program, the commission said that although the uranium reactor far surpasses the cyclotron in quantity production of radioisotopes created by fission and by certain other neutron reactions a considerable number of important isotopes cannot be produced with the reactor. The cyclotron is considered a necessary complement to the reactor for supply isotopes because of the wide variety of nuclear reactions it can produce.

Because of the higher price of cyclotron-produced radioisotopes, the commission will subsidize this program in order to price them at a level that will make them available to most research institutions.

Under the distribution arrangements, the Carbide & Carbon Chemicals Corp., operator of Oak Ridge, will be authorized to purchase cyclotron time from various institutions operating such machines. The Isotopes Div. of the commission will carry out the allocation function in the same manner as it now does the reactor-produced isotopes.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

McIntyre Resigns from OIT

Washington

• • • **Effective** as of Aug. 1, Francis E. McIntyre has resigned as assistant director of the Office of International Trade. He will take a position with the California-Texas Oil Co., locating his office in New York City.

Since entering the government shortly after Pearl Harbor with the Lend Lease Administration, he has served variously as a State Dept. special adviser and director of export control.

West Coast . .

ROBERT T. REINHARDT

• Aluminum losing ground to steel as manufacturers return to first love . . . Rolled steel valves made in Portland . . . Los Angeles claims low factory operating cost.

SEATTLE—There are indications that the day steel sales manager prophesied would come eventually, is actually here—the day when their former customers who embraced aluminum to keep in production, return to the steel fold.

There is no question but what demand for aluminum rolled products is continuing to fall off. Producers report that there has been a steady decline in demand since the first quarter of this year when business was considered excellent and that today many mills are operating at only 50 pct capacity. Reports of the Dept. of Commerce indicate that during May, shipments of all wrought aluminum products was 16 pct lower than the 106 million lb shipped in April and 33 pct below the 133 million lb shipped in May of last year.

Locally the situation is definitely on the down side, with distributors frankly admitting that many of their customers are returning to the use of steel.

A midwestern furnace manufacturer who overloaded with aluminum when he couldn't obtain steel for his work has dumped an estimated several million pounds of aluminum on the local market at a price of 21¢ to 23¢ a lb which is from 5¢ to 6¢ below the market price.

This stock has been brought in from Iowa and Utah and has been sold in Montana, Washington, Idaho and Oregon. Local suppliers believe that the furnace manufacturer is about out of stock since he has recently been offering odd sizes. Alloy aluminum is still in fairly good demand from truck, trailer and plane manufacturers.

Two of the local aluminum distributors have found a definite trend of former customers returning to steel although they have been encouraged to find several manufacturers of heating and ventilating equipment continuing to use the light metal, having learned that it saves them time and money in their operations. One contractor reports that aluminum ducts can be produced at a savings of about 20 pct in labor cost. On the other hand, some of the sign manufacturers are returning to steel having found it more rigid, easier to stabilize and that raised letters and other appendages can be more readily attached.

Manufacturers of building products continue to be the best market for light weight aluminum according to the Permanente Metals Corp. which reports that in 1939 the manufacturers of these products bought 13 million lb of aluminum or 3 pct of the total sales whereas in 1948 the aluminum industry shipped an estimated 769 million lb to building material manufacturers or 37 pct of the total.

Producers of primary aluminum in the Pacific Northwest are continuing to work at as near capacity as electric power availability will permit, although rumors persist that one of the major producers is considering a cutback in basic production.

Los Angeles Study Seeks New Manufacturers

Los Angeles

• • • **Always on the** alert for convincing arguments favoring the establishment of manufacturing plants in this area, the Los Angeles Chamber of Commerce has now produced a study which shows that operating costs of factories in this county are the lowest of eight representative areas in the country.

This section of the state has already substantiated its claim as the third largest industrial center from the standpoint of number of factories established and now makes available a comparison of the cost of power, space heating fuel, processing gas, water, municipal taxes and workmen's compensation insurance. In this study Los Angeles was rated at 4.83 as compared to 6.16 St. Louis; 6.33, Cleveland; 7.16, San Francisco; 7.33, Chicago; 8.50, Detroit; 9.50, New York and 12.00 for Boston.

Of the areas studied, Los Angeles claims to have the lowest power cost and to have the second lowest in space heating fuel rates.

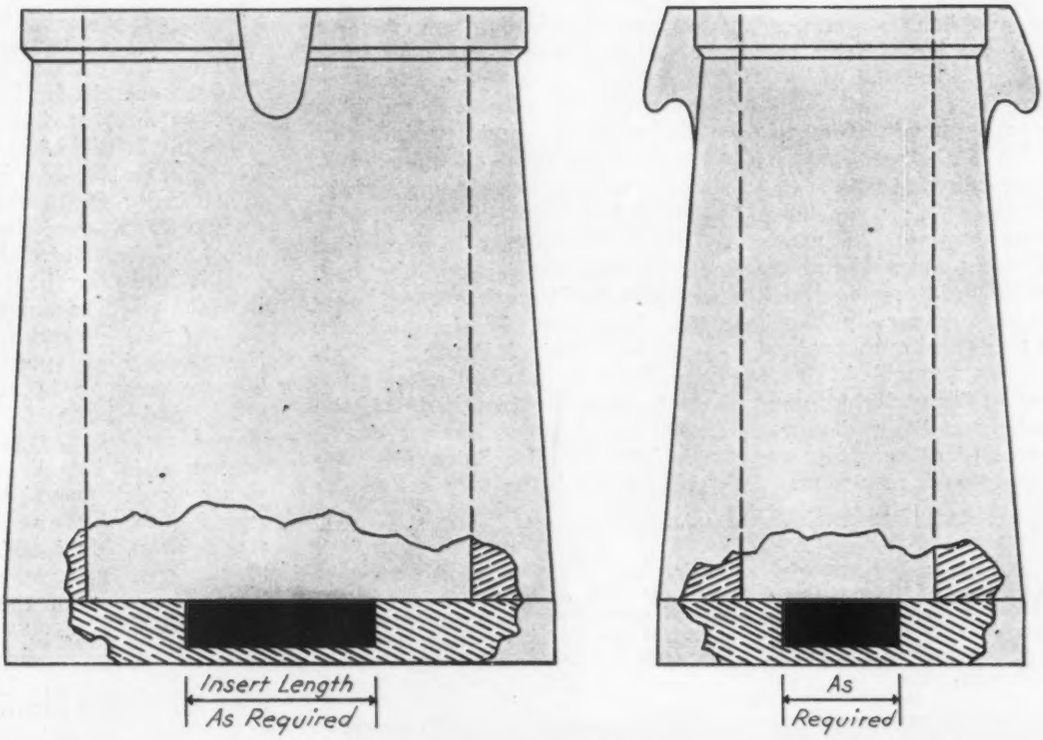
Residential construction in this area continues at a high level although the total for the first 6 months of 1949 was 23 pct below the same period last year. Since January, 1949, there have been permits totaling $351,545,657 issued in the county as a whole. June's permits were off 2.2 pct from May and approximately 20 pct below June of 1948.

It is estimated that dwelling construction authorized so far this year will be sufficient to house more than 103,000 persons.

Announcement last week that Lever Bros. Co. had started construction of a $25 million plant here was hailed with considerable fanfare. This development will send the mid-1949 total of new and expanded manufacturing industries here well ahead of the mid-1948 figure and may bring this year's total above that for last year when investments made totaled $72,181,500.

NO MORE STICKERS!

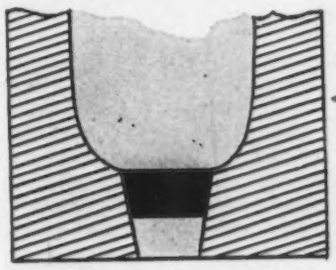
...when you use "NATIONAL" graphite stool inserts!



Use "National" graphite stool inserts in your open-bottom molds and you *eliminate stickers completely and forever!* Other advantages of graphite stool inserts are:

- They increase stool life by a wide margin
- Fewer stools are required — lower foundry costs
- They resist erosive action of falling molten metal

For more information on "National" graphite stool inserts, write to National Carbon Company, Inc., Dept. IA.



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If you use plug-bottom molds, "National" carbon mold plugs save dollars. They last longer . . . weigh less . . . are truer to shape . . . won't stick, spall, or contaminate the ingot. Write us for complete details.

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Introduces New Valves Fabricated From Hot Rolled Steel Plate

Portland, Ore.

• • • **Industrial valves,** fabricated from steel plate, were introduced recently by the Fabri-Valve Co. of America, a new Portland concern. The actual manufacture of the valves is being done by the Northwest Copper Works, Inc., here, a firm having 35 years of experience in metal fabrication.

This new series of valves, ranging in size from 4 in. in diameter up, consists of the same units as conventional valves — the valve gate, body and bonnet—however, each unit is fabricated from hot-rolled steel plate instead of castings.

The gates are made from two pieces of rolled steel separated by steel plate bridging. Around these laminated plates is wrapped a sealing wrapper plate. All pieces are joined using conventional arc welding with stainless steel rod. The gates are generally fabricated on a taper and are machined after they are assembled.

Fabricated from light gage sheet steel, the body features stiffeners welded at carefully determined point to insure a maximum strength. Flanges are welded to the body and all parts machined after fabrication. The construction of the bonnet is similar to that of the body. Yokes are made from mild steel and a conventional pack gland is used.

Although the valves may be obtained with either replaceable seats and discs or with permanent seats and discs, the repair on both types in the larger sizes may be accomplished on the job by welding and buffing. All valves produced are pressure tested to meet the specific requirements for which the valve is designed.

Valves may be produced from mild steel, from a stainless steel, or from any combination of steels. As a result, the valves are finding acceptance in the pulp and paper industry, the chemical industry, oil refinery and distribution plants, food canners and packers and municipal water and sewage disposal systems.

Fabri-Valves have been installed throughout the Northwest by such firms as the Weyerhaeuser Timber Co., Longview, Wash., and the Soundview Pulp & Paper Co., Seattle. Four 42-in. diam gate valves were recently installed at the Hanford Atomic Energy plant, Richland, Wash. Sales are also being made in eastern states. In the Northwest, the valves are sold directly by the Fabri-Valve Co. and distribution in the southern states is being handled by the Southern Corp. of Charleston, S. C. W. G. Rovang is vice-president and general manager.

GET TOGETHER: *New operating and sales heads for Columbia Steel Co., U. S. Steel's Pacific Coast subsidiary. At the right, A. G. Roach, president of Columbia Steel, chats with his new vice-presidents in charge of sales and operations in his San Francisco office. On the left is O. L. Pringle, new head of Columbia sales and in the center is L. S. Dahl, new operations head for Columbia.*

Predicts Planes Flying At 1500 mph by 1960

Los Angeles

• • • **It will be** possible to leave La Guardia Field in New York at 8 o'clock in the morning and arrive here before that hour Pacific Coast time if the prognostications of Harold Luskin, Douglas Aircraft Co. aero-dynamic research engineer come true.

Last week Mr. Luskin presented data to support his predictions that by 1960 airplanes will be racing through the skies at 1500 mph at altitudes of 15 miles, at the annual summer meeting of the Institute of Aeronautical Sciences.

This authority has been working in the field of supersonic flight for the past 5 years and believes that these high speeds will first become common in military aircraft and later in passenger planes. His belief in such performance is based on improvements in jet propulsion engines and improved plane designs to reduce drag. Mr. Luskin forecasts that as speeds increase there will be no decrease in the safety of operation.

Erecting New Plant

Redwood City, Calif.

• • • **National Motor** Bearings Co. has signed contracts for the erection of a new $500,000 plant for its subsidiary, Arrowhead Rubber Co., on an 8-acre site at Downey, Calif. Arrowhead's present plant located in the industrial section of Los Angeles will be abandoned on the completion of the new facilities which will increase production of rubber products threefold. In addition to rubber parts used in the manufacture of oil seals by National, Arrowhead also produces silastic molded and formed parts from a synthetic rubber-like substance. Buttress & McClelland, Inc., drew up the plans and construction will be by E. S. McKittrick, Inc.

PERSONALS

NATHANIEL B. RANDOLPH, president, Granite City Steel Co.

• **John N. Marshall** has been elected chairman of the board and chairman of the executive committee of the Granite City Steel Co., St. Louis. **Nathaniel B. Randolph** has been named president, succeeding Hayward Niedringhaus, who died. **George B. Schierberg** has been elected vice-president and **J. P. Erwin Niedringhaus** has been elected to the board of directors. Mr. Marshall has been a member of the board and of the executive committee for the past 15 years. Mr. Randolph has been associated with the company for 29 years, most recently serving as vice-president, general manager of sales and member of the board. Mr. Schierberg, who replaces Mr. Randolph as vice-president, is secretary-treasurer of the company which he joined in 1930. Mr. Erwin Niedringhaus is assistant sales manager, manager of tinplate sales and advertising manager for the company. He has been with the firm since 1935.

• **W. R. Klinkicht** has been appointed assistant general manager of Pollak Steel Co., Cincinnati.

• **Henry J. Morton,** formerly president of the Morton Gregory Corp., Toledo, has been elected to the newly-created post of chairman of the board of directors. **George E. Gregory,** formerly vice-president, has been elected to succeed Mr. Morton as president and continues also in his present post of general manager of the corporation.

° ° °

• **O. L. Pringle** has been elected vice-president in charge of sales and **Laurence S. Dahl** has been elected vice-president in charge of operations, Columbia Steel Co., San Francisco. Mr. Pringle, who succeeds the late Frank B. DeLong had been serving as vice-president in charge of operations since 1938. Mr. Dahl comes to Columbia from Carnegie-Illinois Steel Corp., where he had been general superintendent of that company's operations in the Youngstown district since 1947. **H. S. Worthington** has been made assistant to the vice-president in charge of operations. Mr. Worthington started with American Steel & Wire Co. in 1915 and in 1933 transferred to Columbia, where he has held several executive positions.

• **John J. Reynolds,** who has been associated with Lukens Steel Co., Coatesville, Pa., as a member of the sales staff in New York, has retired. He has been with Lukens since 1927.

• **William J. Tunny** has been named superintendent of electrical maintenance at the Indiana Harbor plants of Youngstown Sheet & Tube Co., Youngstown. Mr. Tunny joined the company 30 years ago.

GEORGE E. GREGORY, president, Morton Gregory Corp.

STANLEY J. ROUSH, president, Kerotest Mfg. Co.

• **Stanley J. Roush** has been elected president and general manager, **W. G. Swaney,** vice-president and secretary and **R. E. Lane,** treasurer, Kerotest Mfg. Co., Pittsburgh. **Robert C. Downie** and **John D. Dupuis** have been elected directors of the company.

• **James A. Allis** has been elected chairman of the board and **Richard S. Boutelle,** president and a director of the Fairchild Engine & Airplane Corp., Hagerstown, Md. **Arthur F. Flood** has been named vice-president, treasurer, comptroller and a director of the corporation; **George F. Chapline,** Ranger Div., vice-president; **Myron B. Gordon,** vice-president; **Turner A. Sims,** NEPA Div., vice-president; **Paul S. Cleaveland,** secretary. **L. M. W. Bolton, Charles H. Colvin, Earnshaw Cook, E. Ainsworth Eyre, Sherman M. Fairchild, Grover Loening, William D. McIntyre** and **Frank R. Nichols,** have been elected members of the board. Mr. Fairchild's election to the board is subject to the approval of C.A.B. since he is a director of Pan American Airways.

• **Edward R. Anderson** has been named vice-president of the Kellogg division of American Brake Shoe Co., New York, with his headquarters in San Francisco. Mr. Anderson has been with Brake Shoe since 1930. He became district sales manager of the Pacific district for this division in 1947 and continues to serve in this capacity.

CAMERON R. WHITEHORNE, comptroller, International Nickel Co. of Canada, Ltd., and its United States subsidiary, International Nickel Co., Inc.

• **Henry W. Dodge** has joined Mack Trucks, Inc., New York, as executive vice-president with special responsibility for sales and advertising. Mr. Dodge, chairman of the board and director of Air Products, Inc., had been on loan to ECA as chief of petroleum on the staff of Ambassador W. Averell Harriman in Paris. He resigned both positions as of June 30. **J. G. VanNest** has been appointed director of purchases for the company, with overall responsibility for all purchasing for all the company's plants. Mr. VanNest joined Mack in 1928.

HENRY W. DODGE, executive vice-president, Mack Trucks, Inc.

• **Cameron R. Whitehorne** has been appointed comptroller and **William F. Munday,** deputy comptroller, International Nickel Co. of Canada, Ltd., and its United States subsidiary, The International Nickel Co., Inc., New York. Mr. Whitehorne succeeds Frederick P. Bernhard, who is retiring and Mr. Munday succeeds Mr. Whitehorne, who has served as deputy comptroller of both companies and also of Whitehead Metal Products Co., Inc., an affiliate, since 1933. Mr. Whitehorne became associated with International Nickel in 1929. In addition to his offices with International Nickel, he is the principal accounting officer of 12 Canadian subsidiaries of the company. Mr. Munday joined the accounting department of International Nickel in 1918. He has been assistant comptroller since 1933.

• **Herbert J. Rowe** has been appointed sales engineer for the Great Lakes region by Edward Valves, Inc., East Chicago, Ind.

• **C. H. Bartlett,** formerly manager of power transformer sales, has been appointed sales manager for the transformer division at Sharon, Pa., Westinghouse Electric Co., Pittsburgh. Mr. Bartlett, who joined Westinghouse in 1928, succeeds W. W. Sproul. **Frank L. Snyder** has been appointed manager of the transformer division in Sharon, succeeding **John K. Hodnette,** vice-president, who recently became general manager of industrial products with headquarters in Pittsburgh. Formerly engineering manager of the diyision, Mr. Snyder joined the division in 1925 as a design engineer. **E. C. Whitney** has been named manager of the large salient-pole generator section of the A-C engineering department of the transportation and generator division of Westinghouse, succeeding **A. M. Goodison** who has resigned for reasons of health. Mr. Whitney has been with the company since 1935. **Budd K. Strader** has been named eastern district manager of the elevator division, succeeding **Neil C. Reed,** who left the company. Mr. Strader has been connected with Westinghouse since 1911 and since 1945 has been elevator sales manager in the New York area.

AVARD W. TAYLOR, district manager, Carpenter Steel Co.

• **Avard W. Taylor** has been appointed district manager of the Philadelphia and Reading territories of Carpenter Steel Co., Reading, Pa. Formerly assistant manager, Mr. Taylor has been with the company for 10 years. He has his headquarters in Philadelphia.

• **Carl A. Bjelke,** controller of the Doehler-Jarvis Corp., Toledo, is on an indefinite leave of absence. He joined the company in Brooklyn 28 years ago. Mr. Bjelke has been succeeded by **Lester B. Johnson,** chief plant accountant in Toledo since 1945.

FRANK L. SNYDER, manager, Transformer Div., Westinghouse Electric Co.

E. R. KOPPEL, assistant to the president, engineering, Ingersoll Steel Div., Borg-Warner Corp.

• **Samuel H. Reynolds** has been appointed sales manager of the Electrode Div., Great Lakes Carbon Corporation, Niagara Falls, N. Y., succeeding **George O. O'Hara** who resigned from the corporation to establish his own sales agency in California where he represents the Electrode Div., as well as other manufacturers. Before joining Great Lakes, Mr. Reynolds had been with Crucible Steel Co. of America for 24 years, recently serving as manager of stainless steel sales.

SAMUEL H. REYNOLDS, sales manager, Electrode Div., Great Lakes Carbon Corp.

• **E. R. Koppel** has been appointed to the newly-created post of assistant to the president, engineering, Ingersoll Steel Div., Borg-Warner Corp., Chicago, and **W. W. Kovalick** has been appointed chief engineer of the division's West Pullman, Ill., plant. Mr. Koppel has been with Ingersoll since 1944. Mr. Kovalick joined Ingersoll in 1948 as plant engineer. **Adolph Colantonio** has been appointed divisional manager of the Enamel, Tub Form, KoolShade and Automotive departments of the Ingersoll Div. **Charles Fleming** has been named manager and **Robert Pargeon,** foreman of the enamel shop. Mr. Colantonio started with the division as an engineer in 1946. Mr. Fleming had previously been associated with the Crosley division of Avco Mfg. Co. Mr. Pargeon had been connected with the Chicago plant of Hotpoint, Inc.

• **Loren Emery** has been appointed director of industrial public relations of the Hamilton Wright Organization, Inc., New York. Mr. Emery had formerly been associated with McGraw-Hill and International General Electric, in executive capacities.

• **Lawrence F. Parachini** has been appointed manager of the newly-established district sales office in Washington, D. C., of Weston Electrical Instrument Corp. and its subsidiary, the C. J. Tagliabue Corp. (N. J.). Mr. Parachini has been with Weston since 1938.

• **Robert C. Overstreet** has been appointed secretary, Tinnerman Products, Inc., Cleveland. **W. H. Taylor** has been named assistant to the vice-president. **L. H. Flora,** chief engineer and **R. W. Hartman,** manager of field engineering. In addition, Messrs. Flora and Hartman were appointed to the company's executive committee. Mr. Overstreet had formerly been executive assistant to the general manager. He has been with Tinnerman since 1941. Mr. Taylor, who had previously been director of engineering, joined the organization in 1945. Mr. Flora has been associated with Tinnerman for 7 years and prior to his new appointment had been chief development engineer. Mr. Hartman has served the company 10 years and had previously been chief product engineer.

JOHN L. MacQUOWN, sales representative, Warner & Swasey Co.

• **John L. MacQuown** has been appointed to represent the Warner & Swasey Co., Hartford, supplementing the Cambridge, Mass., district sales office activity. Mr. MacQuown has been with the company since 1938. He joined the sales engineering department in 1946 and was assigned to the company's Newark, N. J., and Cambridge, Mass., offices, prior to establishing the Hartford representation. **Eugene R. Gardner** and **S. F. Beatty, Jr.,** have been appointed sales managers of the company's textile machinery and Gradall divisions, respectively. Mr. Gardner was elected to the board of directors in 1945.

ROBERT C. OVERSTREET, secretary, Tinnerman Products, Inc.

• **Norman K. VanDerzee** has been appointed vice-president in charge of sales of Hudson Motor Car Co., Detroit, succeeding **George H. Pratt,** who died. Mr. VanDerzee joined Hudson in 1932 in a merchandising and sales promotion capacity. He has served as regional manager of Hudson's New York zone and as eastern sales manager. He was appointed assistant to the general sales manager in 1945 and was made sales manager in 1947.

• **John A. Kelly** has been appointed assistant to the manager of sales for the construction materials department of General Electric Co., Bridgeport. He has been with the company since 1948. **Edward J. Roddy, Jr.,** has been named district representative for the department, covering the wholesale trading areas of Zanesville and Columbus, Ohio, with his headquarters in Columbus. Mr. Roddy joined G. E. in 1945.

• **Verne W. Bender** has been named manager of distributor sales for Nelson Stud Welding division, Morton Gregory Corp., Lorain, Ohio. Mr. Bender has served as special representative and field engineer for Nelson Stud Welding since 1945, in the San Francisco Bay area, where he has his headquarters.

• **LeRoy E. Cowles** has been appointed to the newly-created position of director of public relations for the GMC Truck & Coach division of General Motors, Pontiac, Mich. Mr. Cowles who has served G. M. in the public relations department for 13 years, has for the past three years been public relations regional manager in Detroit.

• **Gerald H. Karlen** has been appointed district representative for Westcott Chuck Co., Oneida, N. Y., in the metropolitan New York area and Connecticut, Rhode Island and Massachusetts.

• **F. S. Cornell** has been appointed manager of the Water Heater Div., A. O. Smith Co., Kankakee, Ill. Mr. Cornell succeeds **L. B. Smith,** vice-president of the company, who has been transferred back to Milwaukee as assistant to the president.

NORMAN K. VANDERZEE, vice-president in charge of sales, Hudson Motor Car Co.

• **Frank P. Leahey,** who had formerly been vice-president has been made executive vice-president of Nichols Wire & Aluminum Co., Davenport, Iowa. Mr. Leahey has been with the company since 1946. He had previously been associated with American Steel & Wire Co., and prior to that had been connected with Spencer Wire Co.

• **Joseph C. Hess, Jr.,** has been elected vice-president in charge of production of Leeds & Northrup Co., Philadelphia. Mr. Hess, who had served as assistant factory manager of the Germantown plant for some years, succeeds W. R. Coley, who has retired. Mr. Hess has been with the firm since 1916.

• **O. M. Haseltine** has been appointed sales engineer for Ajax Electric Co., Philadelphia, with offices in Chicago, covering northern Illinois, northwestern Indiana, southern Wisconsin and Iowa. He had formerly been connected with Service Associated.

• **William Van C. Brandt** has retired from service with the Electric Storage Battery Co., Philadelphia, where he served as manager of the Exide Railway and Motive Power Battery Sales Div. He has been with the company since 1912.

• **A. J. Fruchtl,** formerly assistant to the vice-president in charge of operations, has been appointed resident manager of the Birmingham plant of U. S. Pipe & Foundry Co.

(CONTINUED ON PAGE 113)

OBITUARY...

• **Van A. Bittner,** 64, international vice-president, CIO United Steelworkers of America, died in Pittsburgh, July 19.

• **Eli A. Round,** 76, fire weld superintendent, Cleveland Chain & Mfg. Co., Cleveland, died July 8.

• **H. C. J. Hambach,** warehouse superintendent, Philadelphia branch, Edgcomb Steel Co., died recently.

• **George H. Pratt,** 61, vice president in charge of sales and a director, Hudson Motor Car Co., Detroit, died July 8.

• **John R. Comstock,** 58, general superintendent, Pittsburgh Coke & Chemical Co., Pittsburgh, died July 14.

• **Reginald A. Steel,** president, R. Steel & Sons, Inc., Long Island City, N. Y., died July 8.

• **Charles R. Holton,** 62, vice-president in charge of purchases, Bethlehem Steel Co., Bethlehem, died July 16.

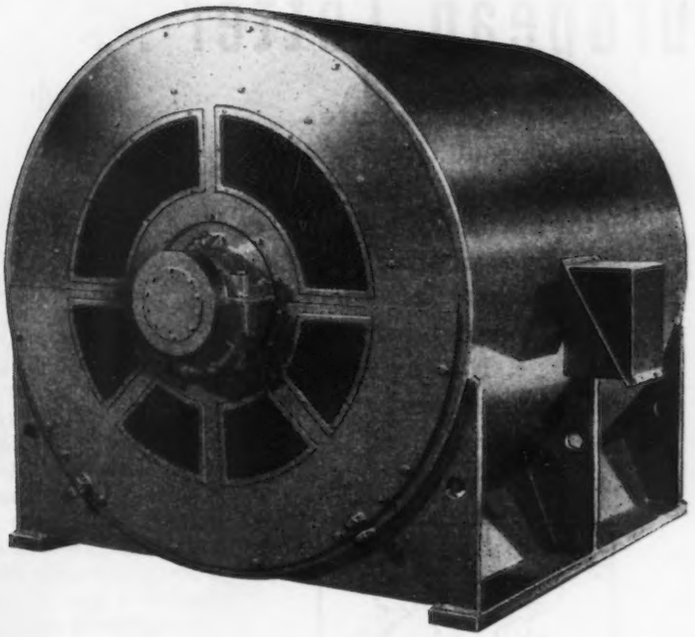
• **William W. Irwin,** 88, founder of 4 sheet steel companies and pioneer industrialist, died in Canton, Ohio, July 19.

• **James M. Davidson,** 44, superintendent of the Buffalo plant of the Farrel-Birmingham Co., Inc., died July 15.

• **Professor C. C. Leeds,** 79, one of the original faculty members of Carnegie Institute of Technology, died July 19 in Pittsburgh.

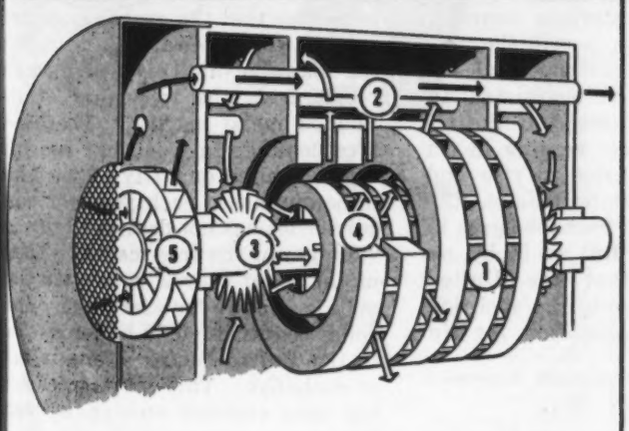
• **Wilton P. White,** 51, mechanical engineer and district manager, Timken Roller Bearing Co., Canton, Ohio, died July 16.

TUBE-TYPE TOTALLY-ENCLOSED FAN-COOLED MOTORS!



INSTALL INDOORS or OUT!

How Tube Cooling Works



Stator core (1) is surrounded by tubes (2). Internal fans (3) circulate air through ducts (4) in rotor and stator and around tubes, transferring heat to tubes.

External fan (5) drives outside air through tubes, removing heat and keeping tubes clean. All electrical parts are enclosed. Dirt cannot enter.

- **Dirt-proof and corrosion-resistant**
- **Heat exchanger is practically *self-cleaning***
- **Simple self-contained cooling system—sizes from 75 to several thousand horsepower**

WHEREVER DUST, DIRT, fly ash, rain and snow, smoke, or corroding fumes keep motor maintenance costs high, this Allis-Chalmers tube-type motor will cut maintenance sharply.

All electrical parts—including stator core—are enclosed. Simple heat transfer system keeps temperatures well within rated limits. Cleaning is rarely needed because air passages are unrestricted. Air flow through the straight tubes removes foreign matter.

Important savings have been proved in three years of field operation. Sizes from 75 hp and up. Also explosion-proof designs. For complete information, outline your requirements to your A-C Sales Office, or write for Bulletins 05B7150 and 51R7149.

A-2610

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European Letter . .

• Many advantages would result from reopening of London metal market . . . Consequences of error serious because of effect on supplies of base metals . . . No proper world metal market for guidance.

LONDON — The Minister of Supply's refusal recently to reopen the London Metal Exchange was the more disappointing because of its air of finality. This time there was no temporizing, despite the Minister's use of the phrase " . . . I am at present unable to agree . . . " It was clear from the key of his remarks that "at present" might mean much longer than a period of months. If he is "unable to agree" now, he is never likely to be able to agree. So, after a year's deliberations on whether the market should be reopened, the government has decided not to give substance to its oft-repeated claim that controls are not being maintained for their own sake. When base metals were extremely scarce after the war, it might have been argued that government buying was a necessary policy to insure supplies for British industry. But these conditions of acute scarcity no longer obtain. On that ground, at least, the time could hardly be more propitious for a resumption of private trading—under suitable safeguards, of course. That opportunity, however, has not been accepted.

The only acceptable reasons for refusing to allow the metal market to reopen, or for not stopping government purchasing, which is the same thing, would be either an overriding case on grounds of public policy or a conclusive demonstration that government buying was cheaper. Neither case has been made out. Mr. Strauss gave two reasons to Parliament. First, he claimed that a free market in nonferrous metals would have to be so severely circumscribed in order to prevent a loss of dollars that any benefits which might be expected to accrue from a metal market would be nullified. The second (which he regarded as "even more important") was that the abandonment of bulk buying of nonferrous metals from Commonwealth sources would seriously endanger Britain's supplies and make this country more dependent on purchases from dollar sources. "For these reasons," the Minister concluded, "I am at present unable to agree to the reopening of the Metal Exchange for the purchase and sale of copper, lead and zinc." Tin is excluded from his injunction; in the first place, it is purchased from sterling sources; and secondly there is still the possibility that an international tin agreement might be negotiated. In other and cruder words, if the resumption of private trading in tin might cause its price to rise and thereby secure more dollars, the government would perhaps agree to a free market. But it is by no means certain that the United States would agree to the abolition of international allocation for tin

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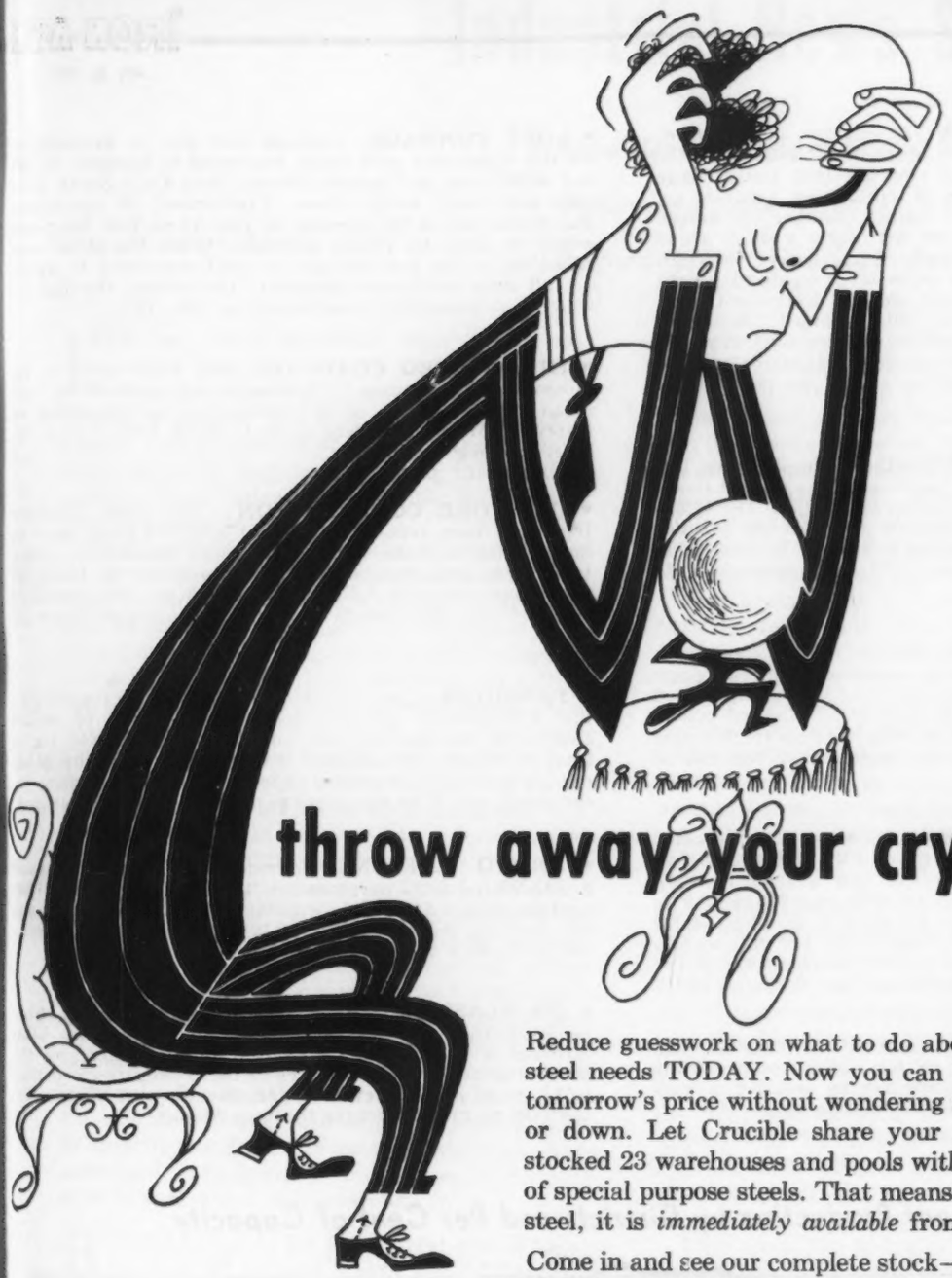
or to an agreement which does not provide for an expansion in tin production and therefore a check to any raising of prices.

THE more the Minister's arguments are examined, the less convincing they seem. To a large extent, they turn on the sources of supply of copper, lead and zinc for British consumers. Britain's annual consumption of virgin copper is about 360,000 tons, of which about two-fifths comes from the dollar area—Canada, Chile and the United States. Supplies from the United States largely consist of Rhodesian copper reexported to Britain after electrolytic refining. Britain also consumes 210,000 tons of refined lead a year, about a quarter of which comes from dollar sources, mainly Canada, while of the 225,000 tons of virgin zinc used each year in Britain, about one half comes from dollar countries. These imports from dollar sources are clearly necessary, whether they are purchased by the government or through the metal market. If the exchange control were efficient, there would be no reason to fear any greater expenditure of dollars to pay for private purchases than has to be provided to pay for government purchases. This is a point of principle which remains quite unaffected by the cuts in imports of dollar metals which the Chancellor announced recently. It is difficult to believe that the exchange control need be so complicated as to nullify the many advantages which would result from the reopening of the London metal market. There are free dealings in wool, but the fact that a limited quantity of wool has to be purchased each year for hard currencies has not destroyed the advantages of the free market. There might be, of course, some risk that metals bought for sterling by non-dollar countries could be reexported to the United States at a cut rate of exchange. This sort of trading has been common enough in wool, though not apparently to any great extent in rubber. Here again it is difficult to believe that, with the help of British merchants, this risk could not be reduced to a minimum, though it is bound to arise so long as exchange rates are artificial and bear no real relation to internal price levels. Even so, we merely have the Minister's *obiter dictum* that the dollar risk is of sufficient importance to justify the continua-

(CONTINUED ON PAGE 135)



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• **FREIGHT ABSORPTION**—Behind the scenes wrangling over legalizing freight absorption went into its third week with the pros and cons meeting almost daily behind closed doors to reconcile differences between the Senate and House bills. While neither chamber has moved to appoint conferees to iron out differences a small group is trying to work out a "package reconciliation" between the O'Mahoney-Walter forces (who favor legalized freight absorption without amendments) and the Kefauver-Carroll group (which approves of the bills provided "Acting in good faith to meet competition" is stricken out). Present plan is to present a "package" to Senate-House conferees, who would then be instructed to accept the compromise without argument.

• **PIPE EXPORTS TIGHTENED**—Oil well casing, line pipe and seamless tubing can no longer be exported under a general license as parts of a pump installation. The Office of International Trade has clamped down on the practice because a lot of steel was moving this way. It limits total amount shipped with a pump to 250 ft, requires separate license for anything else.

• **STEEL FORGINGS**—The Census Bureau reported a drop of 12 pct in shipments of commercial steel forgings during May. Totals for May were 91,835 tons compared with 108,546 tons shipped in May 1948. Unfilled orders for steel forgings at the end of May totaled 412,000 tons compared with 465,000 tons on the books at the end of April.

• **U. S. STEEL EARNINGS**—U. S. Steel Corp. reported net income for the second quarter of 1949 of $44,123,595 as compared with $49,928,670 for the first quarter of 1949. Income for the first 6 months of 1949 was $94,052,265 as compared with net income of $53,443,018, as adjusted for the first 6 months of 1948. Operating rate for the corporation during the second quarter of 1949 averaged 99.8 pct of rated capacity against 101.5 pct during the first quarter.

• **PIPE LINE**—El Paso Natural Gas Co. plans to build nearly 100 miles of pipeline to serve the Army's White Sands Proving Ground and some nearby areas. Construction hinges on Federal Power Commission approval.

• **LOST TONNAGE**—Tonnage lost due to preparation for the threatened steel strike amounted to between 35,000 and 40,000 tons at Carnegie-Illinois Steel Co.'s South Chicago and Gary works alone. Curtailment of operations was begun late in the evening of July 13 so that the plant would be down by Friday midnight. When the strike was called off at the last minute, the mill proceeded to again get all units back into immediate production, the last of which was completely reactivated on July 19.

• **HIGH-PRICED COAL**—The 3-day work week in its captive mines is forcing U. S. Steel to buy commercial coal at an additional cost of $25 million a year according to Harry M. Moses, president of H. C. Frick Coke Co., U. S. Steel's mining subsidiary.

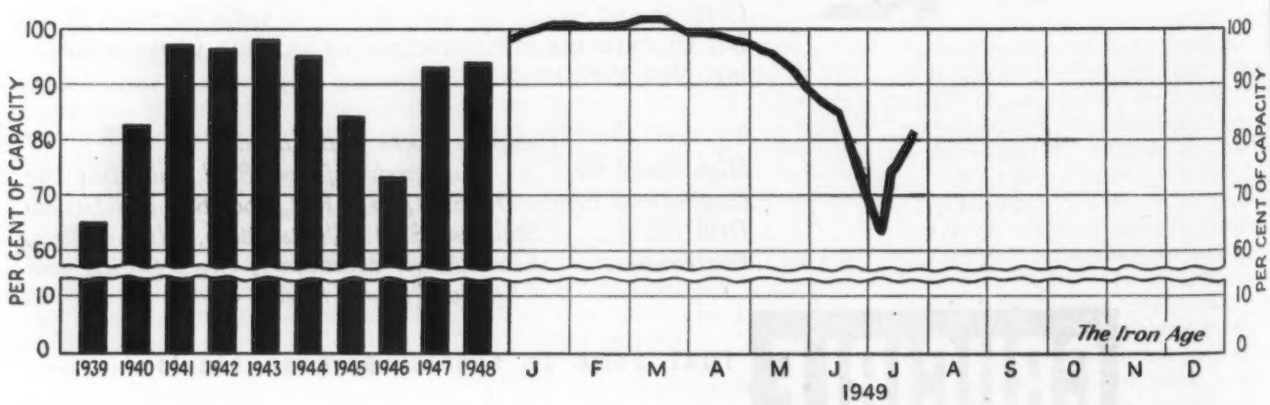
• **IRON ORE CONSUMPTION**—The Lake Superior Iron Ore Assn. reported a drop of 1,028,184 gross tons in the amount of Lake Superior iron ore consumed during June. Ore consumption for June amounted to 6,238,535 tons, compared with 7,276,719 tons in May. Idle furnaces in the U. S. and Canada during June increased from 22 to 46.

• **PENSIONS**—The CIO United Steelworkers estimates that $150-a-month pensions for steelworkers at 65 would cost 6.15¢ per man-hr, and social insurance 4.84¢ for a total of 10.99¢. The estimate is based on a study by Murray Latimer, CIO insurance expert. An earlier estimate by the union was 13.5¢ for pensions, 9.65¢ for social insurance.

• **ARMCO EARNINGS**—Armco Steel Corp. earned $7,703,773, or $1.92 per common share in the second 1949 quarter against $8,404,861, or $2.09 a share in the first quarter. For the second quarter of 1948 earnings were $5,867,347, or $1.45 a common share.

• **ON BLAST**—After a shutdown of some weeks, Shenango Furnace Co. has started up one of its two blast furnaces at Sharpsville, Pa. This resumption increases the number of active blast furnaces in the Youngstown district to 13 out of 25. In New England, Mystic Iron Works will continue to run its furnace through August.

Steel Ingot Production by Districts and Per Cent of Capacity



Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
July 19	75.5*	89.5*	59.0	82.5	87.0	95.0*	89.5	103.0	88.0*	80.5	66.5	87.0	15.0	78.5
July 26	78.5	88.5	62.0	80.0	92.0	98.0	96.0	103.0	98.0	82.0	67.0	87.0	29.5	81.5

* Revised.

Industrial News Summary

- **Steel Orders Show Slight Pickup**
- **Operating Rate Rises by 3 Points**
- **Buyers Lift Price-Cut Pressure**

LIKE any hypochondriac who must wait weeks for the doctor's report, the steel industry has the jitters. This week it is getting a shot in the arm—a slight pickup in orders. The possibility of lower prices on major steel products has been pushed into a dark corner. Steel sales people think it will stay there at least until fall.

Right now the industry is more uncertain of its immediate future than it has been at any time in the past 3 years. Several things contribute to this confusion: (1) Customer pressure for lower steel prices has about stopped; (2) delivery dates on some products are a little more extended than they were a month ago; (3) incoming order volume is up; not sharply but it is better than it was a month ago. However, quick delivery is still a mighty big factor in determining who books steel business.

The first three factors are due at least in part to the steel labor truce. They show the beginning of buyer uncertainty on steel delivery 6 weeks or so hence. And as some products get a little harder to get, the buyers begin to stampede—pushing deliveries still further ahead. That some mills are quoting 6 to 7-week delivery for certain sizes of carbon bars which they have been getting in just a few weeks is amazing purchasing men. And the warehouse field, lethargic for months, has also begun to feel the effects of buyer concern over steel supply. It is still far from the panic state that characterized 1948 markets and there is nothing now to indicate it will approach it.

BUYER pressure for lower steel prices began to ease off several weeks ago. After July 15 it practically stopped. Steel salesmen report less dickering over prices and more concern with delivery dates. The buyer with an unbalanced inventory is shopping around for the fastest delivery. In some cases he will pay $3 to $4 a ton more to get steel quickly from a more distant mill when the local mill can't meet his delivery needs.

This shows that steel fabricators are beginning to clear up some of their excess inventory. But there is still a lot left. It may be late September before the real status of steel users' inventories is known. In the meantime there will be more of this hand-to-mouth buying by firms whose total steel stocks are fairly fat but who are short on specific items.

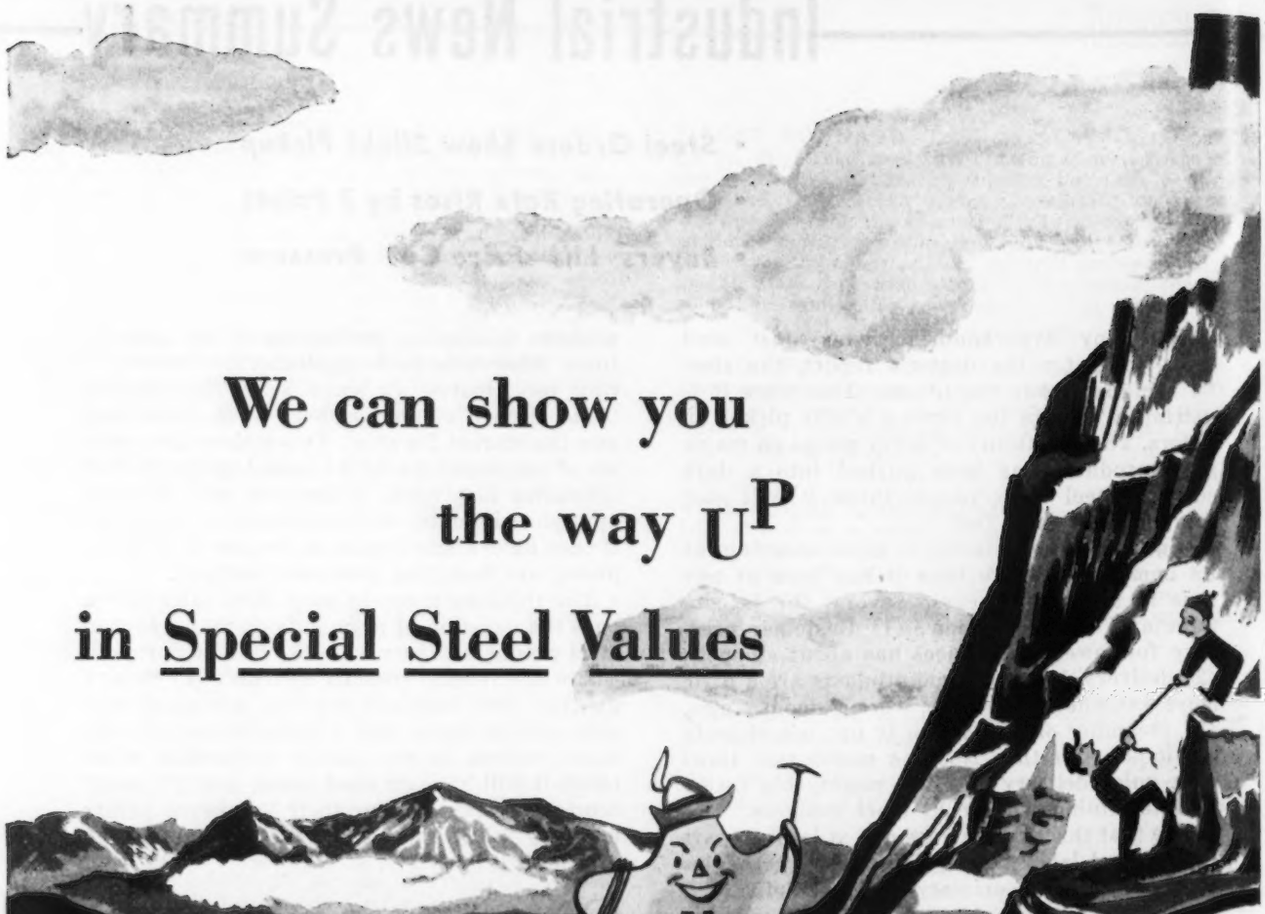
The steel fabricator, on his part, is moving some of his finished product a little faster. Hot weather boosted refrigerator and freezer sales, forcing several manufacturers to quickly recall workers to step up production of the popular lines. Elsewhere in the appliance field price cutting has cleared up some heavy inventories. Some kitchen cabinet makers have come back into the market for steel. Two midwestern makers of automatic washers stepped up production schedules last week. Observers will give the appliance industry another month or so to see if they have a small flash in the pan or if lower prices are restoring consumer demand.

The thinking today in most steel sales offices bars the question of price cuts on major carbon steel products. The possibility is now dormant. There are several reasons for this: (1) Second quarter steel earnings reports, due soon, will show a drop below first quarter levels; (2) the labor outlook is too cloudy to predict what effect it will have on steel costs; and (3) many companies may be near their breakeven points but they won't know what they are until they get there.

ON top of this is the fact that steel buyers have almost stopped trying to drive down the price on every order and have eased off the barrage of letters which they had been directing at their steel suppliers. They may be temporarily discouraged, more concerned over delivery, or coming to the belief that steel is a fair buy today at today's prices. No matter. If the freight absorption bill becomes a law many buyers will be able to play competing mills against each other. The salesman with the sharpest pencil will have the edge and the price subject will be wide open again.

This week the industry set up its schedules to operate at 81.5 pct of rated ingot capacity. This is a 3-point gain over last week's rate. Predictions of August operating rates made a month or so ago have been knocked flat by the postponement of the steel strike. Putting off the threat is not likely to improve total output for the year though it will mean more steel in August than the order books indicated just 2 weeks ago. Some mills which had anticipated August operations ranging from 60 to 75 pct of capacity are now much more optimistic.

Prices for heavy melting steel scrap remained unchanged in major markets this week though the cast iron grades used by foundries have been showing faint signs of strength at Pittsburgh and Chicago during the past few weeks. This week cast prices were stronger at Cleveland, as foundries working on a hand-to-mouth basis have apparently decided there's little chance of pig iron price cuts before mid-September at best.



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The Steel Fact Finders . . .

Their Backgrounds Furnish Food for Speculation

New York

• • • **To business and industry** the recommendations of the board named by President Truman to investigate the steel labor issue may be the most important decision of the year. If it finds in favor of a substantial boost for the union the steel user can say good-by to any hopes of lower prices. That is, if the steel producers should somehow feel obliged to carry out the recommendations.

If it rejects the union position there is a vague possibility of a steel strike. And if a strike doesn't come off the steel buyer will again begin licking his chops for lower prices. This is why guessing the outcome has become a popular pastime in steel circles.

The board is scheduled to have its first public hearing today (July 28) in the U. S. Court House, Foley Square, New York City. The background of its members won't give the outcome-guessers a sure thing; this is a case unto itself. But it may help:

Carroll R. Daugherty, the board's chairman, 49, is a former New Deal economist. He has been professor of economics at the University of Alabama, University of Pittsburgh (1931-1940) and Hunter College. As far as can be determined, he has had no business experience.

In 1936 he was principal economist on labor productivity studies for the U. S. Bureau of Labor Statistics. From 1938 to 1940 he was chief economist of the department's Wage and Hour Div. For the next 2 years he was a special economic consultant of the National Resources Planning Board. From 1942 to 1945 he was wage stabilization director of the National War Labor Board.

With Malvin G. DeChazeau and Samuel S. Stratton he wrote a 2-volume study, "Economics of the Iron and Steel Industry," in 1937. In 1941 he wrote, in "Labor Problems in American Industry," (pp. 128 and 129):

"For this reason employers should accept the obligation of making the same provision for wage earners as they do for their plants and machinery.

"Steel Labor," monthly publication of the Steelworkers union, used this identical argument in a recent issue.—Ed.

"If the latter alternative were chosen, employers would pay for the workers' maintenance and repair and give them enough to live on independently in their old age after they have been scrapped.

"If employers do neither of these things, they are parasitic inasmuch as society must step in and pay for much of what the workers need."

Judge Samuel I. Rosenman is probably the most prominent of the three members of the President's steel-labor fact finding board. The new deal is stamped indelibly in his career. The United Press referred to him as "the famous 'Sammy, the Rose' of early New Deal days."

He was admitted to the New York bar in 1920, and served in the New York State Legislature from 1922 to 1926. From 1929 to 1932 he was counsel to Governor Franklin D. Roosevelt. He was appointed to the New York State Supreme Court in 1932, reappointed in 1938, and later elected for a 14-year term. In 1943 he resigned to become special counsel to President Roosevelt. From June to November of 1945 he was special counsel to President Truman.

During the past 16 years he has played an important part in shaping government policy. In Washington it is a well known fact that he helped write several of the labor and economic speeches of both Presidents Roosevelt and Truman. Before accepting his appointment Judge Rosenman notified the President that his firm represents Rotary Electric Steel Co., Detroit.

David L. Cole is a lawyer and labor relations expert of Paterson, N. J. His experience as labor arbitrator is broad.

He was admitted to the New York bar in 1925, to the New Jersey bar in 1926. He has been a member of the law firm, Cole, Morrill & Nadell since 1932. Since 1937 he has been a director of and counsel for the Commercial National Bank. He has acted as counsel for the Paterson Retail Merchants Assn. since 1940. He has also served as chairman of the New Jersey State Board of Mediation.

STEEL FACT-FINDING BOARD: *President Truman's steel fact-finding board met last week at the White House with Presidential assistant John R. Steelman. Shown left to right at the Executive office are: Judge Samuel I. Rosenman of N. Y.; Dr. John R. Steelman, Presidential assistant; Carroll Daugherty, Northwestern University economist and chairman of the board, and David L. Cole, of Paterson, N. J., a labor relations expert.*

During 1944 he served as chairman of the National War Labor Board steel and iron ore panels, during which time he heard disputes between the United Steel Workers of America and steel producing and iron ore mining industries.

He was chairman of the fact finding board appointed by President Truman in June 1948, which helped settle the coal contract termination dispute. He also served on panels which heard disputes involving nonoperating railroad workers and Railway Express workers in New York.

Only a few weeks ago he served as arbitrator in a wage dispute between the New York World Telegram and the Newspaper Guild of New York, CIO. In this case Mr. Cole ruled that the union wasn't entitled to a wage increase. In summarizing his decision in this case he said; "Thus, neither cost of living comparisons with the same crafts in the industry in New York, the current wage pattern on New York newspapers, comparisons with other crafts in the same plant, comparisons with similar crafts in other industries in New York, gross inequities, nor anything that has happened since the present wage rates were agreed upon by the parties would justify a general wage increase on this reopening."

Quantitative Quotas Removed on Tinplate

Washington

• • • **Removal** of quantitative quotas limiting exports of tinplate and terneplate, effective Oct. 1, has been announced by the Office of International Trade.

Under new "open-end" provisions, to prevail during the fourth quarter of this year, exporters must continue to secure validated licenses covering shipments of the products, and must also observe all other applicable export regulations. All license applications will be screened by OIT for excessive quantities, as well as for end-uses, which must be among those permitted in this country by Allocation Orders M-81 and M-43.

Experts to Survey Several Routes For African Railway Link

Washington

• • • **A joint** preliminary survey by American and British engineers will begin shortly for the purpose of laying groundwork for construction of a proposed railway link between Rhodesia and East Africa.

Experts from the two countries will spend about 4 months in preliminary work along several suggested routes. They will recommend methods and procedures for a later and more detailed survey, and will make an estimate of costs.

Under the usual arrangements for such projects, the Economic Cooperation Administration will foot the bill for dollar costs, including the salaries of the engineers. Great Britain will defray all other costs.

Development of transportation facilities in the area is of special interest to the ECA because of plans for development and expansion of mineral resources such as cobalt, copper and other strategic materials.

The preliminary survey will be directed jointly by Overseas Consultants, Inc., of New York, and Sir Alexander Gibb & Partners, of London.

Three Americans picked by Overseas are already on their way to Rhodesia. They are Paul B. Coffman, president of Standard Research Consultants; Bruce Wylie, railway economist; and Stewart St. Clair, mineralogist. They departed for London in mid-July for a conference with the British before going on to Africa.

New Housing Gaining

Washington

• • • **A month behind** schedule, new housing starts topped the 100,000 mark in June, bringing the total for first half 1949 to 451,000, the Bureau of Labor Statistics reports.

While this is 26,000 less than the year's total at this time last year, it is 5000 units above the June 1948 total. Industry officials say these figures confirm earlier predictions that the gap between this year's level and that of 1948 will be narrowed.

Included in the 6-month total are 20,200 publicly financed dwelling units, largely state and local projects, as compared with 15,000 units for the entire year of 1948.

One-family units are lagging 8 pct behind last year while apartment-type (2-family or more) housing is 4 pct higher. Substantial building is noted in the middle Atlantic and Southern areas.

Sponsors Symposium On Powder Metallurgy

New York

• • • **A symposium** on the Theory of Powder Metallurgy and Physics of Metals will be conducted in Bayside, N. Y. Aug. 24, 25 and 26. Sponsors of the symposium are Metallurgical Research Laboratories of Sylvania Electric Products, Inc. These laboratories are actively engaged in basic research on phenomena associated with powder metallurgy.

Subjects for discussion will include those solid state reactions such as self diffusion phenomena, recrystallization, and grain growth, which are believed to be pertinent to the sintering process. It will also include such practical phases as hot pressing and prealloyed powders.

Interest in Sylvania's basic research programs on these subjects provided impetus for the symposium. The general enthusiasm for the program demonstrates the participants expect the papers and discussions will represent an important contribution to the fundamental sciences.

There will be six sessions with four papers presented at each. Professor G. F. Huettig, head of the department of physics at the University of Graz, Austria, an eminent worker in this field, has accepted an invitation to be one of the key speakers. Among other well known European scientists will be Professor A. Smekal of the University of Darmstadt, Germany. Many outstanding research workers in this country have also accepted invitations and will present papers.

Space limitations make it necessary to restrict attendance to invitations. But those interested in attending should contact H. H. Hausner, at Sylvania Electric Products, Inc.

Pressed Metal Institute Chooses New Officers; Gives Certificates of Merit

Cleveland

• • • **Great problem** of the jet engine, otherwise known as the "plumbers' nightmare" or the flying stove pipe," is critical materials such as cobalt, chrome, manganese and tungsten, A. T. Colwell, vice-president in charge of engineering, Thompson Products, Inc., told members of Pressed Metal Institute at their annual convention here July 20-22.

Part of the problem, he said, is to find substitute materials that will withstand the heat and centrifugal force in the jet engine, to relieve our dependence on foreign sources of supply in case of war.

One of the shortcomings of the jet engine, according to Mr. Colwell, is the amount of fuel needed to keep it in the air, about twice as much as the piston engine. For this reason, long range bombers will probably be equipped with piston engines for some time to come.

He said the blower type was the coming type of jet engine, employing a large axial compressor, which handles 80 lb of air per sec.

Jet production does not promise bright markets for the stamper, however, at this time, Mr. Colwell indicated. Some stampings are used around the electrical system, but not many, in the jet engine as it is made today. He said some hollow turbine blades have been made from stampings. Front and back stamped out and put together with seam welding to make a light hollow part, which is satisfactory, but very expensive.

Woodard G. Jeschke

Woodard G. Jeschke, president, Res Manufacturing Co., Milwaukee, was named president of the Pressed Metal Institute. Other officers named were Howard Wolf, vice-president, and Joseph J. Boehm, secretary-treasurer. Mr. Wolf is assistant to the president of Mullins Manufacturing Corp., Salem, Ohio. Mr. Boehm is president, Boehm Pressed Steel Co., Cleveland.

Announcement of elections took place at the annual banquet of the Institute following business and technical sessions, at which a group of ten representatives of the stamping industry of England were guests. This group is touring the country under the auspices of ECA and through the cooperative efforts of PMI.

Certificates of merit, recognizing service to the industry, were presented at the banquet to four former presidents of the Institute: George Whitlock, president of Mullins Mfg. Corp., F. C. Greenhill, president Acklin Stamping Co., Toledo, Clarence Custer, president American Stamping Co., Cleveland and Walter Gorrell, Philadelphia.

Elected to the board of directors of the Institute at its annual business session were:

Ralph B. Britton, vice president, the Stanley Works, New Britain, Conn.; R. L. Batteiger, president, Coatesville Plate Washer Co., Philadelphia; W. J. Primrose, president, Dickey-Grabler Co., Cleveland; James M. Leake, president, Leake Stamping Co., Monroe, Mich.; Glendon H. Roberts, president, Detroit Stamping Co., Detroit; Sam Morrison, vice president, Morrison Steel Products, Buffalo; C. C. Caditz, president, Northern Metal Products Co., Chicago; R. S. Wagner, vice president, E. R. Wagner Mfg. Co., Milwaukee; Thomas J. Turk, president, Indiana Pressed Steel Co., Muncie, Ind.; T. L. Baker, vice president, National Stamping Co., Detroit; William Von Behren, vice president, Swartzbaugh Mfg. Co., Toledo; R. K. Follansbee, vice president, Sheet Metal Specialty Division, Follansbee Steel Co., Pittsburgh; Harvey S. Johnson, vice-president, Metal Specialty Co., Cincinnati; Owen H. Wenning, sales manager, Worcester Pressed Steel Co., Worcester, Mass.; John F. Herkenhoff, president, Minster Machine Co., Minster, Ohio; Oren H. Persons, sales manager, Edgcomb Steel Co., Philadelphia, and Raymond Peterson, president, Peterson Engineering Co., Toledo.

British Pressed Metal Team Visits Cleveland

Cleveland

• • • **A group** representing the pressed metal industry of Great Britain arrived here under the auspices of the Economic Cooperation Administration and the Pressed Metal Institute.

Officially identified as United Kingdom Metal Team No. 4, the party is comprised of 10 men actively engaged in the metal stamping industry in Great Britain.

On tour of the United States for 30 days, the team is visiting 15 outstanding stamping plants, three of which are located in Cleveland. They will also visit the Republic Steel Corp.'s sheet and strip rolling mill and were in attendance at the national convention of PMI.

Plants being visited in Cleveland include the Fisher Body Div., General Motors Corp., American Stamping Co., and the Dickey-Grabler Co.

In the area they have visited the Mullins Mfg. Co., plant in Salem, Ohio, and will visit the Willys-Overland and Acklin Stamping plants in Toledo.

The team is traveling under the leadership of James M. Phillips, managing director of Motor Panels, Ltd., Coventry. Others on the team represent supervision, press operators and tool designers and die makers.

AISC to Meet in October

New York

• • • **Reservations are** now being made by members of the American Institute of Steel Construction for their annual convention, Oct 31 to Nov. 3. It will be held at the Greenbrier Hotel, White Sulphur Springs, W. Va.

The institute, in announcing the meeting and advising its members to make their reservations with the hotel now, added a historical note. It was at the Greenbrier that Gen. Wade Hampton, governor of South Carolina, said to Zebulon B. Vance, governor of North Carolina, "It's a long time between drinks."

Industrial Briefs . . .

• BEST WISHES, ACF — This year marks the fiftieth anniversary for the American Car & Foundry Co., New York, one of the pioneer railroad equipment manufacturers.

• PONTIAC PLANS—Pontiac Motor Div. of General Motors Corp., Pontiac, Mich., has revealed plans for construction of a new engineering building at Joslyn Road and Madison Ave. It will be a partial two story structure with 213,645 sq ft of working area.

• BEAUTY QUEEN — The Julien Dubuque Bridge, which spans the Mississippi River connecting Dubuque, Iowa, with East Dubuque, Ill., has been awarded a stainless steel plaque by the American Institute of Steel Construction. It was chosen as the most beautiful bridge in the United States, in the class comprising bridges of over 400 ft spans, for the year 1943.

• BUYS OUT—A. S. Campbell Co., Inc., Boston, has announced the purchase of the Rollins Engine Co., Nashua, N. H., manufacturers of special purpose machinery. The newly formed subsidiary, Rollins Engine & Machine Co., will maintain its present plant and organization at Nashua with Russell L. Sylvester, formerly sole owner, as vice-president and general manager.

• SCRAP BROKER—James S. Corbin, formerly eastern division sales manager of the James Flett Organization has announced the formation of James Corbin & Associates, 2854 Hudson Blvd., Jersey City, to engage in the scrap marketing service for industrial and commercial concerns.

• LEAD SPECS DEPT.—National Lead Co., New York, has announced the formation of a new department to serve on matters relating to specifications for various products, test methods and other standards, under the direction of Carlton H. Rose.

• WALLERS IN BUSINESS — Bill and Cliff Waller have announced the formation of the Lead Alloy & Chemical Mfg. Corp. of America, 1923 Westwood Ave., Cincinnati, specializing in soldering and flux application and technique.

• OPENING IN L. A. — A new branch office is being opened Aug. 1 at 1338 South Lorena St., in Los Angeles by P. R. Mallory & Co., Inc., Indianapolis. The new branch, under the direction of J. E. Templeton, will serve customers in southern California and Arizona.

• STEEL SERVICE—Steel Service, Inc., Steubenville, Ohio, has opened a sales office at 1017 Fisher Bldg., Detroit, for flat-rolled steel, and sheared and developed blanks.

• SOMETHING NEW — Burlington Steel Co. Ltd., Hamilton, Ont., has announced the addition of a new product to its list, Hi-Bond reinforcing bars, thought to be the first rolled in Canada. The bars are designed to have high bonding characteristics when embedded in concrete.

• MERGER — Federal-Mogul Corp., Detroit, manufacturers of automotive engine bearings, has announced acquisition of National Formetal Co., Cleveland, manufacturers of rolled split bushings. The firm will be operated as a division of Federal-Mogul.

• SKF GROWS — Expansion of its plant at Shippensburg, Pa., to provide additional facilities for the production of antifriction bearing retainers has been announced by SKF Industries, Inc. This will enable them to take over a substantial portion of work now subcontracted.

• NEW POSITION — T. W. Lippert, formerly directing editor of THE IRON AGE, has been appointed manager of publications of the American Institute of Mining & Metallurgical Engineers, New York.

Cooper Elected Head Of Alloy Casting Institute

New York

• • • **Members** of the Alloy Casting Institute elected Harry A. Cooper as president during their recent annual meeting held in Colorado Springs, Colo. Well-known throughout industry for his pioneering work in the development and growth of the stainless steel industry, Mr. Cooper, president of the Cooper Alloy Foundry Co., Hillside, N. J., pledged himself to active support of the institute's research program and to further development of the very effective and popular Shop Practice Committee.

Harry A. Cooper

Other officers elected at the meeting were: R. W. deWeese, Electric Steel Foundry Co., vice-president and E. A. Schoefer, Alloy Casting Institute, executive secretary and treasurer. B. J. Gross, president, Key Co., and M. G. Moore, Jr., president, Empire Steel Castings, Inc., were elected to serve on the board of directors for a 3-year term.

New Towing Barges

Pittsburgh

• • • **The last can** never be first, and vice versa, with the new integrated two-barge towing fleet launched recently by the Dravo Corp. at its Neville Island shipyards here.

Built for the Mid-Continent Barge Line Co., Minneapolis, the follow-the-leader barges are so designed that the leading barge and the trailing barge must always be lined up in one-two order. The rear of the leading barge and the front of the trailing barge are square for butting together into an integrated unit. Dravo said the unit built for Mid-Continent are the first of the type ever made.

With a combined capacity of 40,000 bbls, the barges will be used for fast transportation of petroleum on inland waterways. Each barge is 240 ft long, 50 ft wide and 12 ft deep.

Weir Expects Steel Output to Shrink To 65 Pct of Capacity In Fourth Quarter

Pittsburgh

• • • **Ernest T. Weir,** chairman of National Steel Corp., is a man who usually says what he thinks. The working press like him because he always answers their questions. The press conference he held here last week was no exception. Reporters leveled questions in rapid-fire order. They were given direct answers, straight from the shoulder.

This direct approach in public relations might be a bit shocking to some conservatives. But those who know Ernie Weir recognize it as the same type of honest frankness he uses in business dealings. He deals 'em off the top, in plain sight.

Steel production will sink to around 65 pct of capacity in the last quarter of this year, Mr. Weir believes. He said that the current status of wage negotiations in the industry has cast even more uncertainty into an already confused steel situation. He expects this to have an adverse effect on production rates.

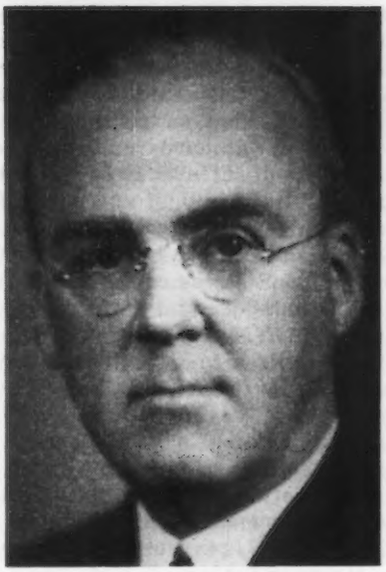
"Steel doesn't know where it stands today," he said. "The industry certainly is in a state of confusion. I believe we wouldn't have gone as low as I think we will in the last quarter if the wage question were settled. And we would have begun to pick up somewhat going into next year.

"But this situation leaves a chaotic uncertainty—I don't know, nobody knows."

Freight absorption by the steel industry is a guarantee against monopoly, and steel companies will return to the policy of absorbing freight charges as soon as President Truman signs the law permitting them to do so, he declared.

"When freight absorption is again permitted, the steel industry will return to it 100 pct. The day we're allowed to do it, we'll go back. Other companies will probably do the same thing. I wish we could do it now. Everybody needs it. It's the natural way to do business. I don't see how you can do it any other way."

Mr. Weir cited the case of Lone Star Steel Co., Dallas, as an example where one company might be able to exercise a monopoly in a given area were competing companies not permitted to absorb freight charges in order to sell at the same prices.



Ernest T. Weir

"This will give you a pretty good idea of a monopoly that would exist if we didn't have competition through freight absorption."

[Lone Star Steel recently was granted a $34 million loan by the Reconstruction Finance Corp. to expand facilities for production of electric weld steel line pipe and oil well casing.]

Mr. Weir also said:

(1) Inventory reduction by steel consumers is still in progress, although some customers now are on a replacement basis.

(2) The steel industry will find ways and means of rounding up enough manganese ore for its needs.

(3) The big oxygen-producing plant under construction at Weirton Steel Co. will start operations about next September.

On the basis of personal observations made on a 2-month visit to England, France and Italy, he said he believes the world is in for the most intense competition for international trade in history. But he believes the U. S. can hold its ground in competition for steel export markets.

He is convinced that European countries are now getting back on their economic feet and are doing everything possible to increase production and lower costs in order to compete in world markets. They realize, he said, that their future well-being depends on increasing production far beyond previous levels. He added that this is true particularly of France and Italy, where he said Communism is definitely on the wane.

Although he believes the U. S. should continue to help European countries, he said the time has come to begin scaling down financial aid, with a view to closing the purse strings entirely by 1952 as scheduled.

He said most European countries would rather receive less aid from us if it means the difference between prosperity and depression for this country. Depressed business conditions in the U. S. are creating fear abroad he reported. "In every country I visited informed and thoughtful persons did not hesitate to say that the worst catastrophe that could happen to the world would be a serious depression in the U. S."

New AEC Station

Idaho Falls, Idaho

• • • **Actual construction** on the new atomic energy station here is expected to get well under way the latter part of this year according to Leonard E. Johnson, manager of the Idaho operations for the Atomic Energy Commission. At present a road is being constructed from here to the station site which will reduce that distance from 55 to 36 miles.

It is expected that by the end of this year approximately 75 atomic energy commission employees will be stationed here and 300 to 400 construction workers will be located at the plant site. By the end of 1950 approximately 200 commission employees will be at the works with approximately 2000 construction employees on the job. Heavy machinery and equipment will be delivered through Pocatello with some fabrication also being done there.

Reinforcing Bar Men Report Progress On Structural Designs at Lower Cost

White Sulphur Springs, W. Va.

• • • **Reports delivered** at the recent meeting of the Concrete Reinforcing Steel Institute here showed more basic design progress in this field in the last few years than there was in the past 2 decades. The 3-day session of the institute's 25th anniversary meeting at the Greenbrier featured technical and business meetings for the representatives of the 105 different organizations which belong to the institute. Its members represent more than 90 pct of all producers and fabricators of concrete bars.

New-style deformed bars permitting higher bond stresses are now being rolled by most producers. Use of square bars will shortly be discontinued so that in the future all reinforcing bars will be rounds. Through simplified practice, applied research and intensive cooperation of all institute members, not only among themselves but with allied groups, wider use of reinforced concrete structures is growing rapidly. Through better design made possible by 6 years of intensive research, costs of reinforced concrete structures are coming down and performance, durability and usefulness is increasing.

C. A. Willson, research engineer of the American Iron & Steel Institute committee on reinforced concrete research, reported on the progress of the various research projects carried on at the U. S. Bureau of Standards and at several universities. He reported that results of pullout and flexural tests started 5 years ago and just completed at the bureau, show higher bond stress could be justified with the new style bars covered by ASTM specification A 305-49 which is being considered for adoption by the AISI A-1 committee on steel. Revisions in the present specification 305-47T have already been approved by the American Society for Testing Materials and the permanent new specification A 305-49 is expected to emerge in the near future.

As a result of tests at the University of Illinois and Cornell University, it has been proved that hooks are not necessary in reniforced concrete construction when using the new-style deformed bars. Many types and sizes of beams and slabs are being tested. Deflection under static loads over long periods of time on these sections are in progress at the University of Wisconsin.

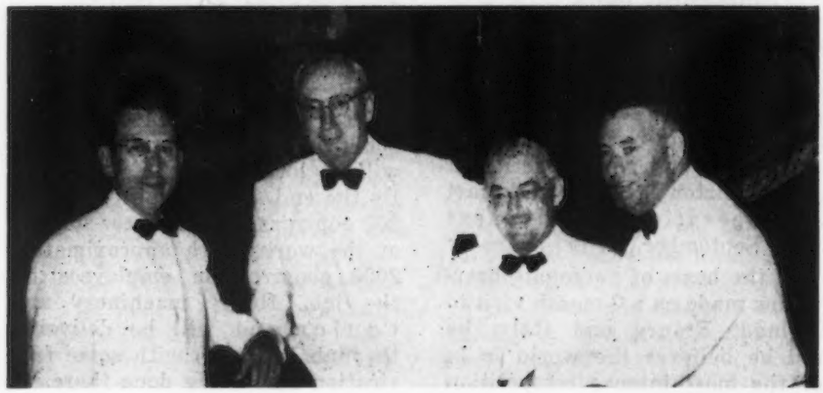
Stresses in both shear and longitudinal bars in many types of reinforced concrete are being accurately measured by using SR4 strain gages in the new series of diagonal tension testing in progress at the Bureau of Standards. All these programs are initiated and planned by the concrete bar manufacturers and financed by them. Results of such studies are being compiled and will be published in standard manuals.

The concrete institute has under its direction similar research projects. Their committee on detailing reinforced concrete highway structures is under the chairmanship of H. D. Jolley, Ceco Steel Products Co., Chicago. Results of a series of many tests carried on jointly with the Illinois State Highway Dept. are being compiled and their first manual, "Useful Data," will come off the presses next year and will contain the latest information for detailing reinforced concrete highway structures.

Another highlight of the meeting was the first presentation of the CRSI annual award for noteworthy contribution to reinforced concrete design. It went to C. F. Whitney of Amman & Whitney, New York and Milwaukee, in recognition of the winning paper "Thin Shell Concrete Structures." This development has permitted longer spans of arched reinforced concrete such as used in aircraft hangers and similar structures.

Guest speaker David F. Austin, vice-president, U. S. Steel Corp., spoke on "Planning for Progress." He attacked the visionaries who are constantly offering panaceas for doctoring our economy. The U. S. Steel sales executive said he is not afraid of subversive groups who may wish to destroy our type of business, industry and therefore government, but rather "the alarming number of people in this country who unknowingly are turning away from the ideals of free enterprise and are moving unwittingly into the direction of a welfare state. These are not furtive groups, plotting revolutionary schemes in some dimly lighted room. They are high minded, God fearing, peace loving, loyal Americans, sincerely searching for greater security than they have now, greater security than they think free enterprise will provide. This group seems anxious to turn to the government as a panacea for every ill."

REELECTED—*Officers to continue for another year were relected at the 25th annual meeting of CRSI. Left to right they are J. R. Fenstermaker, treasurer; E. B. Wilkinson, first vice-president; W. H. Stewart, second vice-president, and Herbert E. Calves, president. Mr. Calves is vice-president of Taylor Davis, Inc., Philadelphia. Mr. Stewart is manager of sales, Reinforced Products Div. Truscon Steel Co., Youngstown. Mr. Wilkinson is vice-president and general manager Wilson, Weesner, Wilkinson Co., Knoxville, Tenn. Mr. Fenstermaker is president, Hugh J. Baker & Co., Indianapolis.*



Chamber of Commerce Says Labor Gains More from Price Cuts Than Wage Hikes

Washington

• • • **Labor can gain** more for itself and the general economy by exerting pressure for price reductions than by driving for fourth-round wage hikes, the United States Chamber of Commerce believes.

Speaking for the organization, Herman W. Steinkraus, president, last week said that, at best, such increases could be obtained in only a few industries and would therefore benefit a relatively small percentage of the labor force.

At the same time, he added, price increases which almost always follow increased labor costs would penalize the majority of workers and all consumers.

Referring specifically to the current labor agitation in the steel and automotive industries, it was pointed out that regardless of merit in claims that these industries can afford to boost wages, the fact remains that many other industries indisputably cannot.

Should wage hikes be granted in these two major industries, approximately 3 million workers would benefit by additional purchasing power. And since steel is a basic industry, any increase in steel prices would cause some 57 million other workers to feel the additional pinch in the cost of living.

Among the fallacies in the Nathan report, compiled for the CIO, as the Chamber sees it, is the attempt to set an arbitrary break-even point for any industry. For the steel industry, Mr. Nathan set the break-even point at roughly 33 pct.

The error lies in attempting to set an across-the-board figure. While the break-even point for some firms, under some conditions, might be 33 pct or even lower, for others it might be double that figure or higher.

Yet, a fourth round of wage increases would in the majority of cases be industry-wide, tending to force high-cost operators to layoff workers or perhaps to shutdown operations entirely.

Recognizing the fact that retail prices have been slow to drop despite reductions in raw material costs, this is held to be the traditional pattern since simultaneous price drops by manufacturers and retailers (whose inventories were obtained at the higher cost) would be ruinous to the latter. Goods made under reduced basic costs are just now reaching store shelves.

As to the charge in the Nathan report that price reductions have been altogether too slow, it is pointed out that in face of the current agitation for fourth round wage boosts, industry scarcely dares to make any effective action in that direction.

The Chamber suggests that workers declare a moratorium on demands for new wage increases and turn their attention to increasing productivity, thereby contributing to lower costs and reduced prices.

In this way, says the Chamber, prices and wages will reach a more equitable level. After all, the organization says, "it is not the number of dollars in a pay envelope that counts most but what those dollars will buy. A 20 pct increase in productivity would force 20 pct drop in prices."

American Radiator May Reopen Closed Plants

Pittsburgh

• • • **Bright spot** on the business horizon is the announcement by American Radiator & Standard Sanitary Corp. that sales have picked up to the extent that some closed plants may be reopened before year's end.

Theodore E. Mueller, president, believes the company's sales and earnings have reached their low point and that business will be better from here on in 1949. Sales for the first half of the year will be about 17 pct off from 1948's 6-month total of $101,313,875.

Company plants at Pittsburgh and Baltimore are now idle, as is its boiler foundry at Buffalo. The Louisville plant is operating part time. A blast furnace at Tonawanda, N. Y., shut down May 1, is now back in operation. Because of high production costs, the Pittsburgh operation probably will be the last to start up.

Hardest hit by slumping business were the company's plumbing and heating operations, which were off at least 50 pct, Mr. Mueller said. Company potteries, however, have continued at full production; china plant at New Orleans will soon go into operation.

ATOMIC ENERGY DISCUSSION: *Government leaders met in Washington last week for a discussion of U. S. relations with Britain and Canada in the atomic field. Left to right: David Lilienthal, chairman of the Atomic Energy Commission; Gen. Dwight D. Eisenhower, temporary chairman of the Joint Chiefs of Staff; Senator McMahon, D., Conn., chairman of the Senate-House Atomic Committee; Secretary of State Dean Acheson, and Secretary of Defense Louis Johnson.*

Hand-to-Mouth Buying Appears in Canadian Iron and Steel Market

Toronto

• • • **Hand-to-mouth** buying has developed in Canadian markets. But most of this is from consumers who are finding business in their particular lines slipping off. So far the only big layoffs in Canadian industry have been in agricultural implements and mining.

Demand for steel is tapering off due to (1) the summer holiday season and (2) the fact that consumers are less concerned about inventories and are making no effort to maintain or increase their stocks. Recently there has been some slowing in new orders. But this has had little or no effect on domestic production.

C. B. Lang, president of Dominion Steel & Coal Co., on an inspection trip to the company's subsidiary plants in Ontario, stated that it is quite evident that steel production in Canada has caught up with demand. He predicted that new construction no longer would be hampered by steel shortages. He further pointed out that the steel export situation is at a standstill and that little improvement could be expected until the muddled foreign financial conditions are remedied or greatly improved.

The bulk of Canada's exports in the past year have been rails ordered for shipment particularly to India and South Africa. Payment for these was to have been made in U. S. dollars, and up to 6 months ago, because of the dollar shortage in Canada, priority for these export orders was given at the expense of domestic orders for the needs of Canadian railroads. The steel controller now has ordered that Canadian needs be met, even at the expense of delay in completion of the orders for overseas shipment.

Canadian Pacific Railway, which draws most of its rail requirements from Algoma Steel Corp., reports that it will receive sufficient tonnage this season to allow the handling of its full track-laying program. It is expected that the Canadian National Railway order for steel rails with Dominion Steel & Coal Co. will be completed around the end of December.

G. P. Wilbur, manager of the Ontario division of Dominion Bridge Co., stated that structural steel shapes were more readily available. "We are still dependent on U. S. supplies for the larger sections, but deliveries from across the line now can be classed as immediate," he said.

With the exception of the $3 per ton cut in the price of galvanized sheets, and a reduction all down the line of $2 per ton in steel scrap, Canadian steel prices remain at government ceiling. However, the feeling in this country is that any swing likely to take place in steel prices will be downward.

50 YEARS AGO

THE IRON AGE, *July 27, 1899*

• "Railway managers at upper lake ports are complaining of the movements of ships, and say there are not enough ports to carry ore at the docks and that both mines and ore roads are capable of delivering a very considerable quantity in excess of the amount moved by lake."

• **"Information wanted—Who manufactures steel, copper and brass molds for making loaf sugars?"**

• "The shortage of pig iron is most serious in Bessemer pig, and it is reported that one large interest has been drawing steadily on its emergency stocks and may be soon forced to supplement its own supply by purchases in the open market."

• **"The critical period for corn and spring wheat is at hand, and absorbing interest will be taken for 2 or 3 weeks in weather conditions."**

• "The sudden rise in the prices of crude and finished iron and steel has lead to a flood of letters from readers of THE IRON AGE asking for figures on many different articles produced in the furnace, the steel plant and the rolling mill."

• **"The demand of the boiler makers of Chicago for shorter hours and higher pay is another of those ill-advised movements which drive trade from large cities."**

• "The Garland Chain Co., Rankin, Pa., manufacturers of chain, have granted their employees an advance of wages averaging about 15 pct, which is the third advance made by this concern since the first of the year."

• **"The uneasiness and scarcity of labor is one of the most serious phases of the present situation. The slightest pretext is apparently seized upon for an opportunity to strike."**

Steep Rock Iron Mines Expect Record Season

Toronto

• • • **Steep Rock** Iron Mines, Ltd., has good prospects of attaining its objective of 1.2 million tons of iron ore this year and may exceed this total according to M. S. Fotheringham, vice-president and general manager. While heavy rains in the area have slowed shipments this year they total 300,000 tons, which is 50 pct ahead of last year. He stated that the pit is in good shape and the company expects to average between 9000 and 10,000 tons daily for the rest of the season.

Steep Rock Iron is preparing for substantially enlarged production. Plans for the development of the "A" orebody are being studied, and contractors are completing plans for the big dredging equipment that will be necessary for the job. It is hoped production will start from the "A" orebody in about 2 years. Arrangements have been made with the Ontario

Hydro-Electric Commission for extra power. The Canadian National Railways has indicated willingness to enlarge the ore dock at Port Arthur as requirements dictate.

The only exploration done in recent years has been a limited amount on the "B" orebody at the southeast end. Drilling, which is being continued, indicates that upwards of 2 million tons of ore may be developed in this section, which previously was not believed to be ore-bearing. Work also indicates the ore has widened beyond its normal width of 125 ft in this sector.

Research May Find New Substitute For Imported Palm Oil

Chicago

• • • **The steel industry** uses about 7500 tons of palm oil annually in the hot dip tinning processes. All such oils have been imported from North Africa or the East Indies and supplies were greatly curtailed during World War II because of hazards encountered on the long shipping lane. Heretofore there has been no domestic source of palm oil and up until now no substitute in general use.

Research scientists at Armour Research Foundation in Chicago are achieving successful laboratory results in the development of a synthetic substitute for palm oil. Mill tests are soon to be run on a wide scale to determine the usefulness of the new synthetic.

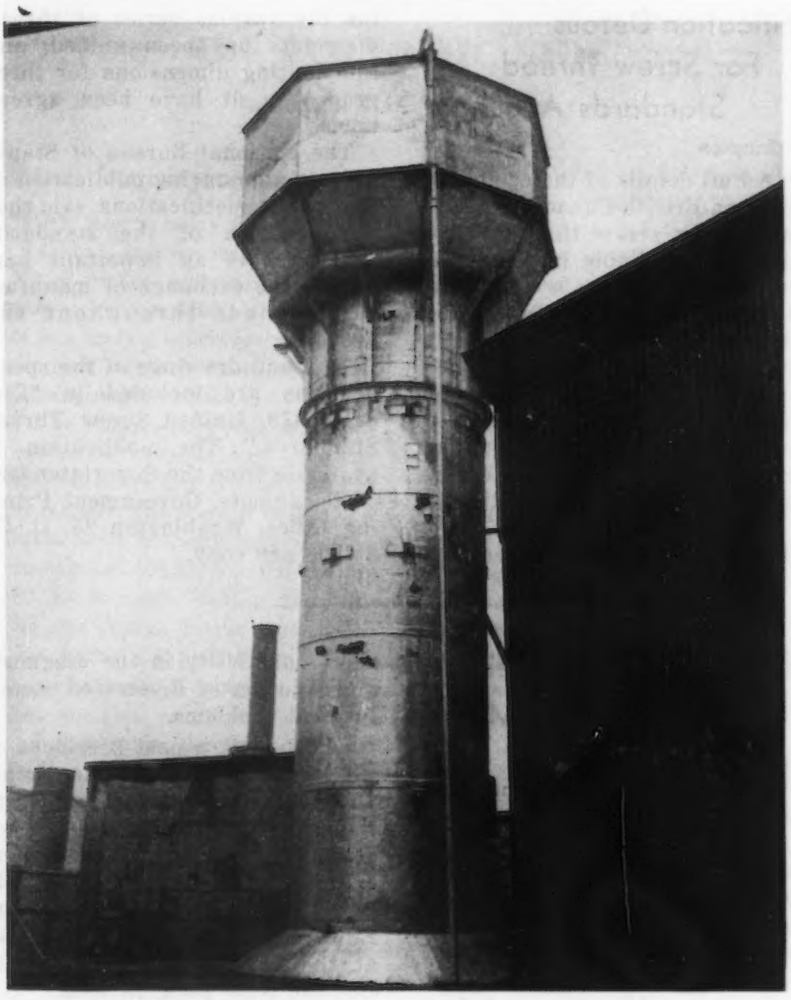
Before the war palm oil sold as low as 8¢ a lb and after the war it went as high as 40¢ a lb. Price fluctuations plus transportation difficulties brought about the investigation at Armour which is sponsored by the American Iron & Steel Institute.

The problems were many. The substitute to function properly must possess low volatility, have a high flash and fire point, neither oxidize nor polymerize readily. It should be capable of making a smooth bright tinplate that will drain rapidly and freely, and have a low enough viscosity to permit pouring or pumping. In addition it must be nontoxic, odor free, and preferably edible, and should not become rancid during storage.

These characteristics plus the fact that the substances should not interfere with lithographing, lacquering or soldering, and should retard atmospheric corrosion, have posed complex problems for the research engineers working on the development.

After extensive basic research on tinning oil action, the foundation selected dimerized linoleic acids as having the best possibilities. This fatty acid only recently has become available in quantity and it is made from common vegetable oils by heating them under pressure in contact with steam.

Various esterified dimer acid products are known to have satisfactory low temperature viscosity characteristics. From their work so far, the foundation scientists have concluded that satisfactory tinplate can be made with 100 pct free fatty acid if the acid is not too volatile or viscous.



Solves Foundries' Air Pollution Problem

Cleveland

• • • **A home-brewed answer** to foundries' air pollution problems turned up here recently when Ferro Machine & Foundry Co., Inc., installed an octagon-shaped dust suppressor designed to eliminate the heavy emission of pollution from a cupola stack.

The dust suppressing unit traps almost entirely the 450 lb of coke and iron oxide blown into the air every hour from each stack.

Designed by Ferro plant engineer Maurise Degley and associates, the suppressor consists principally of a series of high pressure streams of water which wash the smoke, capture the pollutants and salvage them as sludge.

The suppressor is 40 ft high, 84 in. in diam, and weighs 10,000 lb. It was fabricated in Ferro's shops by Ferro's mechanical department and installed by plant personnel.

Unification Details For Screw Thread Standards Available

Washington

• • • **Full details** of the combined American-British-Canadian specifications for screw threads have been made available in published form.

Unification of standards for nuts, bolts, and all types of screw threads in the three countries was agreed upon in November 1948. The unification agreement provides a 60° angle and a rounded root for screw threads, with either flat or rounded external thread crests.

The number of threads per inch for the various series of thread diameters has been unified, and the limiting dimensions for three grades to fit have been agreed upon.

The National Bureau of Standards, in announcing publication of the unified specifications, said that the adoption of the standards "will remove an important barrier to the exchange of manufactured goods throughout the world."

Text and drawings of the specifications are included in "Circular 479, Unified Screw Thread Standards." The publication is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 30¢ per copy.

Edgar C. Bain to Receive 1949 A.S.M. Gold Medal

Cleveland

• • • **Dr. Edgar C. Bain,** vice-president, Carnegie-Illinois Steel Co., will receive the 1949 Gold Medal of the American Society for Metals, according to W. H. Eisenman, ASM national secretary. The medal will be awarded Dr. Bain in recognition of his great versatility in applying science to the metal industry.

Presentation of the Gold Metal will be made at the annual dinner of the American Society for Metals, to be held in the Grand Ballroom of Cleveland's Hotel Statler, Thursday evening, Oct. 20, during the 31st National Metal Congress and Exposition.

The Gold Medal of the American Society for Metals was established in 1943 to recognize outstanding metallurgical knowledge and exceptional ability in the diagnosis and solution of diversified metallurgical problems.

Dr. Bain is a past president of the American Society for Metals and has made many notable contributions to the art and science of metals through his active membership in the Society. The 1949 ASM Gold Medalist was the Edward deMille Campbell lecturer at the annual ASM meeting at Buffalo, New York, in 1932.

Dr. Bain was the recipient of the American Society for Metals' Distinguished Service Award in 1948 for his meritorious contribution to progress in Alloy Steels.

M. A. Hanna Profit Up

Cleveland

• • • **M. A. Hanna Co.** reported net profit of $4,366,045 for the first half of 1949, after all charges, including provision of $917,133 for depreciation, depletion and amortization, and $1,163,303 for federal taxes on income. Profit is equivalent after preferred dividend requirements to $4.05 a share on the 1,030,464 common shares. In the first half of 1948, net profit was $3,949,669, equal to $3.64 a common share.

The company's net profit in the second quarter of 1949 amounted to $2,878,869, equal to $2.70 a common share. It compared with $2,499,146, or $2.33 a share, in the second quarter of 1948.

Survey Shows June Business Off With More Lower Prices

Chicago

• • • **Generally poorer** business conditions are reported for the month of June by the business survey committee of the Purchasing Agents Assn. of Chicago. Deliveries are continuing faster and more prices are down than up over the previous month. Inventories, production and order backlogs are the indicators to watch according to the business survey committee.

Although general business continues to decline, there is a slight improvement noted in inventories, order backlogs, etc. Buying policies during June reflect a buyers market when 50 pct of those questioned reported they are buying on a 30 day basis.

Two special questions were asked in the survey, No. 1, when do you expect to have your inventory in satisfactory balance, and No. 2, will you resume normal quantity purchases when your inventory is in balance?

To question No. 1 over 80 pct indicated inventories will be satisfac-

AMERICAN IRON AND STEEL INSTITUTE — 350 Fifth Avenue, New York 1, N. Y.

Blast Furnace Capacity and Production—Net Tons — June - 1949 (Month)

	Number of companies	Annual blast furnace capacity	Production: Pig Iron — Current month	Pig Iron — Year to date	Ferro Manganese and Spiegel — Current Month	Ferro Manganese and Spiegel — Year to date	Total — Current month	Total — Year to date	Percent of capacity — Current month	Percent of capacity — Year to date
DISTRIBUTION BY DISTRICTS:										
Eastern	12	13,353,580	947,014	6,270,604	30,880	179,993	977,894	6,450,597	89.0	97.4
Pittsburgh-Youngstown	17	26,625,920	1,739,187	12,215,460	25,284	132,699	1,764,471	12,348,159	80.5	93.5
Cleveland-Detroit	6	6,984,600	446,090	3,268,088	-	-	446,090	3,268,088	77.6	94.3
Chicago	7	15,655,390	1,052,447	6,810,402	12,978	17,258	1,065,425	6,827,660	82.7	87.9
Southern	9	5,010,060	387,888	2,447,255	6,604	41,735	394,492	2,488,990	95.7	100.1
Western	4	2,912,300	170,546	1,258,197	-	-	170,546	1,258,197	71.2	87.1
TOTAL	37	70,541,850	4,743,172	32,270,006	75,746	371,685	4,818,918	32,641,691	83.0	93.3

torily balanced by the end of the third quarter. Only 9 pct anticipate delaying this condition until next year. Most of the companies indicated inventories are already balanced for July.

Regarding the second question, barely 50 pct intend to wait for a sales pickup before resumption of normal quantity purchases. This is because of the minimum lead time required for purchases and an extremely rapid vendor performance.

Westinghouse Turns Down Fourth Round Demands of Workers

Pittsburgh

• • • **Westinghouse** Electric Corp. has turned down the CIO United Electrical Workers' demand for a fourth round wage increase and pension and social insurance package totaling $500 a year. The General Electric Co. had rejected a similar demand earlier.

As a consequence of the rejection, Westinghouse-UE negotiations have been recessed indefinitely.

Westinghouse Vice-President W. O. Lippmann said the company was in no position to grant wage boosts, with orders for the first five months of 1949 off 11.5 pct from 1948 and consumer pressure increasing for lower prices.

Edward J. Matthews, chief UE negotiator, said Westinghouse profits were 300 pct higher in 1948 than in 1940 and that the economic position of Westinghouse workers has been worsening due to decreased working hours.

Reconversion Work Ends

Portland, Ore.

• • • **Consolidated Builders,** Inc., the shipbuilding concern owned by the Henry J. Kaiser interests, completed the last major reconversion job in the Pacific Northwest last week when it delivered the former C-2 type troop ship now renamed the Lena Luckenbach.

Conversion operations cost approximately $1 million which was paid largely by the Maritime Commission for the ship which is to see service in intercoastal trade.

Completion of this work will see the layoff of approximately 400 men while 100 others will be retained on the company's payroll. It is reported no other major conversion or construction jobs are in sight and Consolidated looks forward to only drydock repairs or conditioning idle ships for layup in the reserve fleet.

This last contract amounted to $646,000 for Consolidated and approximately $300,000 for the Moore Drydock Co. in Oakland, Calif.

Viewing the News from

The ECONOMIC SIDE

By JOSEPH STAGG LAWRENCE

Steel Inquiry

THE steel industry views the fact-finding inquiry instituted under White House initiative and pressure with considerable misgiving. It is a feeling which has nothing to do with the facts that any honest inquiry might reveal.

The workers have had three successive increases in pay plus substantial fringe benefits since the end of the war. The average worker now takes home a weekly pay envelope containing $58.52, compared with $27.85 in 1939. Making allowance for the change in the cost of living during this period, his real income in terms of what his pay will buy has gone up 23 per cent.

Furthermore, the trend of those factors which organized labor ordinarily utilizes to justify the naked use of its great power is unfavorable. The cost of living has dropped 3 per cent from its peak and is obviously going further. The earnings of the steel companies in the second quarter reflect the impact of lower operations and relatively inflexible costs. Finally, the consumer at the end of the production line is in no mood to submit to higher prices. The seller's market in steel is a thing of the past.

In fair logic the major arguments advanced by labor in this postwar period have had little authentic merit. Its case has rested mainly on the claim that the cost of living has gone up and that profits in the steel industry have been high.

These contentions have propaganda value to labor, they permit emotional exaggerations of the kind that make a case arresting and plausible, if not convincing. Both arguments are two-edged swords.

The pay to which a worker is entitled depends primarily on the value he can contribute to the final product, a value measurable in the quality of his work and its quantity, i.e., in the worker's productivity. The fellow who makes this decision in the end—the real employer of the worker—is the consumer. To be sure, the problem is complicated by a joint effort in which the final product is the result not only of labor but of managerial decisions and equipment.

However, when the top boss—the consumer—buys less, it means unemployment. When he pays less, it means a lower return to be divided between labor and capital. Collective bargaining may affect the division of the profits between the parties in production. Where one of these parties enjoys monopoly power, as is the case with organized labor, deliberate scarcity may increase the price per unit—but only at the cost of reduced consumption.

All this may seem elementary. Yet labor leadership at the present time is in effect trying to deny the facts of life and change laws of behavior which defy the most absolute mortal monarchs.

A fair inquiry can be expected to reveal all this. In the face of such revelation it may be asked why the industry should feel uneasy.

Its apprehension on this occasion arises from doubt regarding the motives of executive intervention, the integrity of the fact-finding body, the circumvention of the Taft-Hartley Act which was designed to cover precisely such emergencies, and finally the certain exposure of the industry to headline prejudice and propaganda pressure.

Construction Steel . . .

• • • **Fabricated steel awards** this week included the following:

960 **Tons,** Lancaster, Pa., general hospital, to Lehigh Structural Steel Co., Allentown, Pa.

742 **Tons,** Chester County, Pa., Pennsylvania Turnpike Section 28-A, Lane Construction Co., Meriden, Conn., contractor, to Bethlehem Steel Co., Bethlehem.

574 **Tons,** Brooklyn, N. Y. Wyckoff Heights Hospital to Grand Iron Works, New York.

570 **Tons,** Chester County, Pa., Pennsylvania Turnpike Section 27-C, Lane Construction Co., Meriden, Conn., contractor, to Bethlehem Steel Co., Bethlehem.

270 **Tons,** Indianapolis, Tenth St. Bridge to Central States Bridge & Structural Co., Indianapolis.

230 **Tons,** Chester County, Pa., Pennsylvania Turnpike Section 27-B, to Bethlehem Steel Co., Bethlehem.

200 **Tons,** Peoria, Ill., Building for Bemis Bros Bag Co. to Mississippi Valley Structural Steel Co., Decatur, Ill.

160 **Tons,** Columbia, Pa., building for Columbia Malleable Castings Co., to Goetz Welding Co., Harrisburg, Pa.

160 **Tons,** Canyon Ferry Dam, Mont., four regular gates with hoists, etc., Bureau of Reclamation, Denver, Spec. 2681, to Williamette Iron & Steel, Portland, Ore.

150 **Tons,** Philadelphia, building for St. Joseph's classroom, House of Good Shepard, to Robinson Steel Co., Philadelphia.

100 **Tons,** LaGrange, Ill., building for Electro Motive Corp., Div. General Motors Corp., to J. T. Ryerson & Son, Inc., Chicago.

100 **Tons,** Sanders, Ariz., overpass, St. Johns-Sanders highway from junction U. S. 66, through H. L. Royden, Phoenix, to Consolidated Western Steel Corp.

• • • **Fabricated steel inquiries** this week included the following:

9300 **Tons,** Cairo, Ill., Railroad bridge for the Illinois Central Railroad.

1000 **Tons,** Tickstown, S. D., intake gates U. S. Bureau of Reclamation, through U. S. Engineers Office, Omaha.

800 **Tons,** Cumberland County, Pa., Pennsylvania Turnpike Section 22 A-1, due Aug. 10.

500 **Tons,** Lancaster County, Pa., Pennsylvania Turnpike Section 25-C, due July 29.

500 **Tons,** Des Moines, Ia., Hospital building.

210 **Tons,** Chicago, Lake St. bridge. American Bridge Co., Pittsburgh, low bidder.

430 **Tons,** Cumberland County, Pa., Pennsylvania Turnpike Section 21 B-1, due Aug. 10.

280 **Tons,** Cumberland County, Pa., Pennsylvania Turnpike Section 21 B-2, due Aug. 10.

260 **Tons,** Lancaster County, Pa., Pennsylvania Turnpike Section 26-A, due July 29.

100 **Tons,** Danbury, Conn., 3-span steel I-beam bridge. Brunalli Construction Co., Southington, Conn., low bidder.

• • • **Reinforcing bar awards** this week included the following:

900 **Tons,** Philadelphia, Southwest treatment plant, to Hughes-Foulkrod Co., Philadelphia.

583 **Tons,** Lancaster County, Pa., Pennsylvania Turnpike Section 25 A, general contract to H. J. Williams, York, Pa.

508 **Tons,** Chester County, Pa., Pennsylvania Turnpike Section 27 C, general contract to Lane Construction Co., Meriden, Conn.

492 **Tons,** Lancaster County, Pa., Pennsylvania Turnpike Section 25 B, general contract to Ralph Meyers, Pittsburgh.

435 **Tons,** Chester County, Pa., Pennsylvania Turnpike Section 28 A, general contract to Lane Construction Co., Meriden, Conn.

350 **Tons,** Wilmington, Del., store for John Wanamaker & Co., John McShain & Co., Philadelphia, general contractor, to Bethlehem Steel Co., Bethlehem.

• • • **Reinforcing bar inquiries** this week included the following:

500 **Tons,** Portland, Ore., structures on Tillamook St.-Broadway Bridge section of Pacific Highway West, Oregon State Highway Commission, Portland, bids to Aug. 2.

463 **Tons,** Nazareth, Pa., Northampton County Home, job postponed.

417 **Tons,** Chester and Montgomery Counties, Pa., Pennsylvania Turnpike Section 28 B-1, L. G. DeFelice & Sons, North Haven, Conn., low bidder.

398 **Tons,** Chester and Montgomery Counties, Pa., Pennsylvania Turnpike Section 28 B-2, L. G. DeFelice & Sons, North Haven, Conn., low bidder.

145 **Tons,** Hancock, Rochester, Wallingford and Weston in Vermont, 5 covered bridges for U. S. Forest Service.

100 **Tons,** Danbury, Conn., 3-span steel I-beam bridge. Brunalli Construction Co., Southington, Conn., low bidder.

Coming Events

Sept. 12-16	**Instrument Society of America,** conference and exhibit, St. Louis.
Sept. 14-16	**Porcelain Enamel Institute,** annual forum, Columbus, Ohio.
Sept. 25-Oct. 1	**American Institute of Mining & Metallurgical Engineers,** midyear meeting, Columbus, Ohio.
Sept. 26-28	**National Electronics Conference,** Chicago.
Oct. 3- 5	**American Coke & Coal Chemicals Institute,** annual meeting, Skytop, Pa.
Oct. 4- 6	**Industrial Packaging & Materials Handling Exposition,** annual convention, Detroit.
Oct. 10-14	**American Society for Testing Materials,** West Coast meeting, San Francisco.
Oct. 12-15	**Electrochemical Society,** semiannual meeting, Chicago.
Oct. 13-15	**Foundry Equipment Manufacturers Assn.,** annual meeting, White Sulphur Springs, W. Va.
Oct. 17-21	**National Metal Congress,** Cleveland.
Oct. 24-26	**American Gear Manufacturers Assn.,** annual meeting, Chicago.
Oct. 27-28	**Porcelain Enamel Institute,** annual meeting, French Lick, Ind.
Oct. 31-Nov. 3	**American Institute of Steel Construction,** annual convention, White Sulphur Springs, W. Va.

• • • **Steel plate awards** this week included the following:

2500 **Tons,** Waukegan, Ill., Public Service Co. power plant to Carnegie-Illinois Steel Corp., through Mississippi Valley Structural Steel Co.

• • • **Sheet steel piling inquiries** this week included the following:

85 **Tons, Waukegan, Ill.,** Public Service Company power plant.

• • • **Railroad car inquiries** this week included the following:

The New York Central Railroad is inquiring for 1000 gondolas which will require between 7000 and 7500 tons of shapes, bars and plates.

National Starts Pipe Mill

McKeesport, Pa.

• • • **After being** out of the market since the beginning of the war, National Tube Co. will be competing for business in the large diameter pipe field next spring, when a mill now under construction at the National Works here is completed.

Work has just begun on the mill, which will turn out electricweld and expanded steel pipe 26-in. diam and larger at the rate of 100,000 net tons annually in 40-ft shipping lengths. The mill is scheduled to be in production next March.

National tube has not produced large diameter pipe here since its original mill was scrapped to make way for an ordnance production line at the start of the war.

Aluminum Tread Plate

Davenport, Iowa

• • • **Aluminum Co.** of America hopes to expand sales of its aluminum tread plate now that its Davenport works has produced it in strip form for the first time, thus reducing costs.

Before installation of the strip-rolling equipment, the tread plate was produced on single stand mills in sections approximately 20 ft. long. Sections up to approximately 400 ft. in length are now being rolled.

An engraved roll mounted in the last mill stand creates tread patterns in longitudinal or criss-cross design. Ranging in gage from $\frac{1}{8}$ in. to $\frac{3}{8}$ in., the plates are rolled in 60-in. widths on the five-stand continuous mill.

Part of First Blast Furnace Foundation Uncovered in East

New York

• • • **Archeologists** have unearthed part of the foundations of the furnace where the first iron was made in the United States more than 300 years ago, according to American Iron & Steel Institute. The location is on the right bank of the Saugus River, a few miles from Lynn, Mass. Further digging is going on.

This progress is being made under the direction of the Reconstruction Committee of the First Iron Works, composed of members of the First Iron Works Assn. and American Iron & Steel Institute, consisting of J. Sanger Attwill of Lynn, Mass., Rufus Harte of New Haven, Conn., W. R. Ingalls of Ingallsby, Mass., John W. Higgins of Worcester, Edward L. Bartholomew of Boston, Walter S. Tower and Irving S. Olds of New York, Edward L. Ryerson of Chicago and E. G. Grace and Quincy Bent of Bethlehem, Pa.

R. W. Robbins, who has been connected with New England archeological history, is in charge of explorations on the site. Neal Hartley of Massachusetts Institute of Technology is to head the work of historical research.

The foundations of the 1643 plant are being located and correlated. The details of the plant construction are being assembled from all possible sources bearing upon the contemporaneous records of that period here and abroad. When all the data are at hand and authenticated, the work of reconstruction will begin, to the end that the First Iron Works will be accurately reproduced on the original site.

It is hoped that sometime in 1950, the project can be completed and established as a public museum; a permanent monument to the beginning of iron and steel production on this continent, dedicated to the memory of the American Steel Master who in the intervening period of 3 centuries has brought the industry to undisputed world leadership.

PERSONALS

(*Continued from page* 92)

• **A. T. Timmerman** has been appointed representative for eastern Wisconsin and Michigan peninsula territory for Automatic Control Co., St. Paul.

• **Winston Jones,** former Conlon division sales manager of the Conlon-Moore Corp., Chicago, has been appointed sales director for the newly-consolidated sales departments of the Conlon and Moore divisions in the midsouth territory of Illinois, Kentucky, Missouri and Tennessee. Mr. Jones continues his headquarters in Chicago.

• **Wilbur Borton** has been appointed special engineer and **Frank Duytschaever,** molding practice supervisor, American Steel Foundries, Alliance, Ohio. Mr. Borton succeeds **R. A. Williams** and Mr. Duytschaever replaces **R. W. McKenzie.**

• **E. M. Burger** has been assigned to the Mexico City plant of the Goodyear Tire & Rubber Co., Akron, Ohio, as manager of mechanical goods development and technical service. Mr. Burger joined Goodyear in 1943.

• **Mauray I. Cohen** has resigned from Harry Harris & Co., Kearny, N. J., and its subsidiaries.

• **Alan E. Aune** has joined Burndy Engineering Co., Inc., New York. Mr. Aune had formerly been manager of aircraft and automotive wire sales for the U. S. Rubber Co.

• **Russell H. Colley** has been appointed consultant in the marketing field on the New York staff of McKinsey & Co., Chicago. He had recently been connected with A. S. Bennett Associates, Inc.

• **John N. Landreth,** formerly assistant general manager of the Gulf Coast & Santa Fe Railway, has been appointed assistant to the operating vice-president of the Santa Fe Railway System, with headquarters in Chicago. He succeeds **W. L. More,** who has been appointed general manager of the Santa Fe Eastern Lines at Topeka, Kan.

• **Fred J. Walters,** vice-president, Hotpoint, Inc., Chicago, has assumed responsibilities for direction of the marketing activities of the company.

• **Murray Hauptman** has been appointed chief inspector and process engineer of the Detroit Harvester Co., Detroit. Mr. Hauptman had previously served as process engineer at Graham-Paige Motors Corp. He has been with Detroit Harvester since 1945.

• **Leonard G. Daniels** has been appointed to the executive staff of Precision Metalsmiths, Inc., Cleveland, as metallurgist and design engineer.

• **F. B. Atwood,** formerly supervisor of industrial engineering and production control, has been named manufacturing superintendent for the radio tube plant of Sylvania Electric Products, Inc., Huntington, W. Va. He has been with Sylvania since 1943.

• **Oren G. Rutemiller** has been appointed chief engineer of the Morton Mfg. Co., Muskegon Heights, Mich. Mr. Rutemiller had previously been associated with Westinghouse Electric Corp., the Crosley Div., Avco Corp., and in the past several years has been consulting engineer for several machine tool and special machinery manufacturers in the Cincinnati area. **H. A. Osborne** has been named manager of the welding fixture division of the Morton Co.

• **Alexander Kennedy, Jr.,** assistant to the manager of the Aircraft, Federal and Marine divisions in charge of engineering, of the General Electric Co., Schenectady, has retired after 41 years. **W. E. Jacobsen** has been appointed assistant manager of the Federal and Marine Engineering division of the company. Mr. Jacobsen joined G. E. in 1934.

• **Eugene C. Hammond** has been appointed head of the Rural Roofing Products Sales Dept., Aluminum Co. of America, Pittsburgh.

• **J. J. Kelleher** has been appointed to the newly-created post of assistant sales manager of the Explosives Dept., Hercules Powder Co., Wilmington, Del. **L. C. LeBron** succeeds Mr. Kelleher as manager of the contractors division.

ECA Studies Proposal To Lengthen Iron, Steel Investment Program

Washington

• • • **A proposal** is now under study by the Economic Cooperation Administration which would stretch out the Marshall Plan iron and steel investment program over 7 or 8 years.

The program at present envisions a European finished steel production of more than 44 million metric tons by 1952-53 as compared with the prewar average of 31.5 million tons.

The investment program involves expenditure of $3.1 billion. Of this amount, about $600 million worth of production materials and equipment would have to be imported, about $400 million from the United States.

Since consumption by ECA nations in 1952-53 is estimated at less than 39 million tons, the ECA foresees an excess capacity, especially for flat products. The net exportable steel surplus by 1952-53 is estimated at about 6,600,000 tons, more than double prewar.

"The proposal (made by OEEC) appears sound from the standpoints of availability of equipment, financing requirements, and time required for development of market patterns," ECA officials here said.

The OEEC had pointed out that extension of time for completing the program would allow a better analysis of markets and permit "better rationalization of the program" with respect to types and quantities of steel to be produced.

In the meantime, a clearer picture is emerging as to what will be expected from the steel industry of the United States over the coming 12 months. Less finished and more semifinished steel products will be asked, according to latest ECA estimates.

In metric weight, 1949-50 purchase authorizations will be sought for 159,000 tons of semifinished steel from U. S. suppliers as compared with 140,000 tons for 1948-49. In finished products, some 982,000 tons will be asked as against 1,140,000 tons for the past year.

The dollar value of this trade will be about $110 million as

against about $120 million this year.

Altogether, the ECA 1949-50 requirements will total about 1 million tons of semifinished and 5,800,000 tons of finished products, the difference between American purchases and the total to be obtained from other ECA nations.

Norway and Benelux will require the largest individual tonnages of finished steel—266,000 and 140,000 tons respectively. Other steel import requirements, by nation, are: United Kingdom, 79,000 tons; Denmark, 75,000; Turkey, 67,000; Sweden, 62,000; Switzerland, 50,000; Greece, 41,000; Bi-Zone 33,000; Italy, 30,500; Portugal, 27,000; Ireland and the French Saar, 13,000 each; Austria, 6000; and Iceland, 2000 tons.

For the French, Dutch and Belgian overseas territories, the requirements will be 35,000, 34,000 and 10,000 tons, in that order.

Completes Experimental Model of Flying Boat

San Diego

• • • **Those who proclaimed** the flying boat as dead following the war appeared to have made a bad guess as Consolidated Vultee Aircraft Corp. announced completion of the first of two experimental XP5Y-1's, high performance Navy patrol flying boat.

Work on the XP5Y-1, which brings out the first real postwar model of a seaplane, began during the war. Changes in plans have been made several times to incorporate in the 60-ton airship many new discoveries. The plane will be powered by four propeller-turbine Allison engines and is expected to have a speed faster than many land-based war-time bombers.

The new craft, which is the Navy's pride, has a high length-beam ratio hull, high wing and single-fin tail. It is capable of long-range day and night search and of rescue and antisubmarine operations.

Western Steel Concerns Surprised at Steel Truce

San Francisco

• • • **Capitulation** of the major factors in the steel industry to President Truman's truce proposal came as a surprise to West Coast independents and subsidiaries alike.

Columbia Steel Co. and Bethlehem Pacific Coast Steel Corp. had made arrangements for orderly shutdowns of all production facilities, whereas independents were going to follow the lead of the majors.

Kaiser Co., Inc., at Fontana was not affected by the situation since its contract with CIO United Steelworkers does not expire until Aug. 16. Therefore no move was afoot to close down their furnaces.

A spot check showed that practically all steel users had adequate stocks to carry them through for 3 to 4 weeks although there were some shortages of reinforcing bars reported and building contractors were somewhat concerned that the scarcity of one or two products might close down entire jobs. Warehouses throughout the West which had allowed inventories to fall to a low point, had within the past 2 or 3 weeks been increasing stocks as rapidly as possible to carry them through any strike period. In general, warehouses are better prepared to handle a heavy demand than at any time within the last 6 months.

GM Sponsors Training Program for Dealers

Flint

• • • **General Motors** picks its dealers young—and trains them.

From Sept. 26 to Oct. 24 more than 500 young men will begin training in the retail automobile business at General Motors Institute at Flint.

High school graduation, sponsorship by a General Motors dealer and a sincere desire to enter the retail automobile business are requirements for entrance.

The program provides for alternate periods of study and directed work experience with the sponsoring dealership. The course extends over a 2-year period.

Ingersoll Steel Makes Safety Program Pay

Chicago

• • • **The Chicago** plant of the Ingersoll Steel Div. of Borg-Warner Corp. has completed 1 million man-hr of work in which there was not a single accident serious enough to cause an employee to take time off, according to J. A. White, works manager. These accident-free hours were worked during the last 5½ months.

A safety program "tailor-made to fit the individual plant, the individual department and the individual employee" is carried out through close cooperation between employees and management, Mr. White said.

The interest of the employees in their own safety is stimulated by a "personalized" educational program conducted by M. H. MacMillan, personnel manager.

If an employee is injured even slightly, a description of the occurrence is posted on bulletin boards, showing how the accident happened and how it might have been avoided. Similarly, when what might have been an accident, is avoided through an employee's having taken the proper safety precautions, that case also is publicized on the bulletin board.

Lightning Rods Protect Mount Vernon's Trees

Pittsburgh

• • • **The trees** on George Washington's Mount Vernon place may some day succumb to the ravages of time. But the chances are better than 3000 to 1 that they won't fall victim to lightning. They're equipped with lightning rods.

Edward Beck, Westinghouse Electric Corp. lightning expert, says the historic trees planted by President Washington are protected by wires run up the trunks to carry lightning off harmlessly.

Westinghouse lightning studies show that an isolated building 100 ft sq and 30 ft high is likely to be hit on the average of once every 10 or 15 years. But with a mast or lightning rod 55 ft high on top of the roof, the odds against being hit change to once in 3200 years.

Factory Sales for Cars Climb 17 Pct Above '48

Detroit

• • • **Through May**, U. S. factory sales climbed 17 pct over a year ago, according to official reports by the Automobile Manufacturers' Assn.

This is the third highest period in the history of the industry, AMA disclosed. Total for the 5-month period is expected to reach 2,400,644.

Strikes affecting several producers cut the May total to 11 pct, AMA said.

The total shipments for the month included 394,703 passenger cars, 86,200 motor trucks and 564 motor buses.

Passenger car shipments abroad held at the level of the preceding month, the agency said, although truck shipments abroad dropped nearly 4000 units. Through May, foreign shipments are lagging 24 pct behind 1948, aggregating 140,185 units.

Automatic Ladling Used for Diecasting

Chicago

• • • **A new method** of automatic ladling has recently been developed by Lindberg Engineering Co., Chicago. The design of the unit is a direct outgrowth of the development of a new two-chamber induction melting furnace by Lindberg.

The operation of the unit is extremely simple and can be run by one man. The discharge side of the furnace is sealed over with a metal plate through which extends a refractory tube. The discharge chamber is connected to the injection sleeve just ahead of the piston by means of a hollow graphite block and a graphite tube mounted on the furnace cover.

Through the cover is a pressure line connected to a nitrogen tank equipped with pressure control and solenoid valve. A timer synchronized with the diecasting machine controls the valve, which when open admits approximately 1 lb of pressure to the surface of the molten metal. By controlling the length of time, the amount of pressure, and the diameter of the graphite pipe, the quantity of molten aluminum or tin forced into the die casting machine can be accurately metered.

John Crerar Library Offers Free Services

Chicago

• • • **The research** information service of the John Crerar Library of Chicago which was instigated in 1947 has grown appreciably. At that time the organization employed one person half time in its information service devoted exclusively to science and technology. Today they have a staff of 11 engaged in assembling research information in all the important sciences.

This division of the world's largest free public library devoted exclusively to science, has a sustaining contract with the Atomic Energy Commission which they furnish current abstracts of all material published which may be of interest to the AEC. A large pharmaceutical house keeps one person employed full time at the library who does nothing but supply this organization with abstracts appearing in all pertinent journals.

The library, in its more than 50 years of operation, has built up a collection of nearly 700,000 volumes and currently receives more than 15,000 periodical publications. The research information service is run on a nonprofit basis and this department is equipped with microfilm and photostat service facilities. This branch of their service is endowed by many companies in the industrial field such as American Steel Foundries, Inland Steel, International Harvester Co., Standard Railway Equipment Co. and others.

The cost of projects done in the past few years runs from a minimum of $12 to several thousand. The RIS branch of Crerar will simply compile references for an individual to come in and survey their findings and take notes or ask for photostats. They will go further and cull over their compiled references and send abstracts to the customer so that he can select copies of what he desires. The third step is that the RIS personnel will write critical reviews on the subjects they are asked to investigate.

MACHINE TOOLS

. . . News and Market Activities

Machine Tool Shipments Up in June But New Firm Orders Drop

• • •**Machine tool** shipments rose to a new 1949 high in June, but new firm orders dropped to a new postwar low, according to the preliminary report of National Machine Tool Builders' Assn.

NMTBA'S index of June shipments was 79 compared with 72.8 in May and 75.8 in March, previous monthly high for 1949.

Index of new orders for June was 53.8 compared with 63.7 in May. New foreign orders in June were 15.8, unchanged from the previous month.

Ratio of unfilled orders to shipments also dropped to a new low of 3.5 to 1 for the year at the end of June, compared with 4.4 to 1 at the end of May.

The NMTBA index is based on average annual shipments for the 3 years 1945, 1946 and 1947, which amounted to about $344 million.

Trade sources are charging part of the drop in new firm orders to plant vacation periods and continuing threat of a fourth round wage increase in steel. Summer is traditionally an off-season saleswise for the machine tool industry, but August prospects looked pretty lean this week, despite the volume of inquiries.

In the East, there is guarded optimism. Some segments of the industry report that things look better with some of the tool and die shop business expected to break this month. Sales of at least one major company are ahead of last year's sales at this time.

In Detroit, the volume of machine tool business is holding, although at very low levels. However, the high volume of inquiries continues as a buoyant factor in the machine tool industry here, according to informed trade sources. The amount of engineering work in progress is at a substantial level, trade sources report, and it is confidently expected that in due course a considerable part of the present work will be reflected in orders for new tooling.

Plant Vacation Periods And Threatened Wage Increase Slows Down New Orders

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Specifically, there have been some additional placements by Borg-Warner, for the new Studebaker automatic transmission. This activity is expected to wind up within the next few weeks. No further ordering for the Ford die-casting program has been reported this week. Reports last week (THE IRON AGE, July 14, p. 160) that the proposed new Dodge engine program has been shelved have been reconfirmed this week.

In Sidney, Ohio, Monarch Machine Tool Co. announced that 56 of its lathes, many of them equipped with special tooling, are currently being shipped to European countries. Willis Kuhlman, of Monarch's demonstration and service staff, has been sent abroad to supervise the installation of the machines. Mr. Kuhlman will spend some time in at least ten European countries, including England, France, Holland, Belgium, Denmark, Switzerland, Italy, Austria and Finland. In addition to other special equipment, about one third of the 56 lathes destined for installation abroad are equipped with the "Air Gage Tracer," one of Monarch's postwar developments.

In Cleveland, National Machine Tool Builders' Assn. announced that in recognition of the necessity for more effective sales presentations by the machine tool industry, nearly 350 sales managers, district managers and salesmen for NMTBA members and American Tool Distributors' Assn. will attend the special summer conferences on selling.

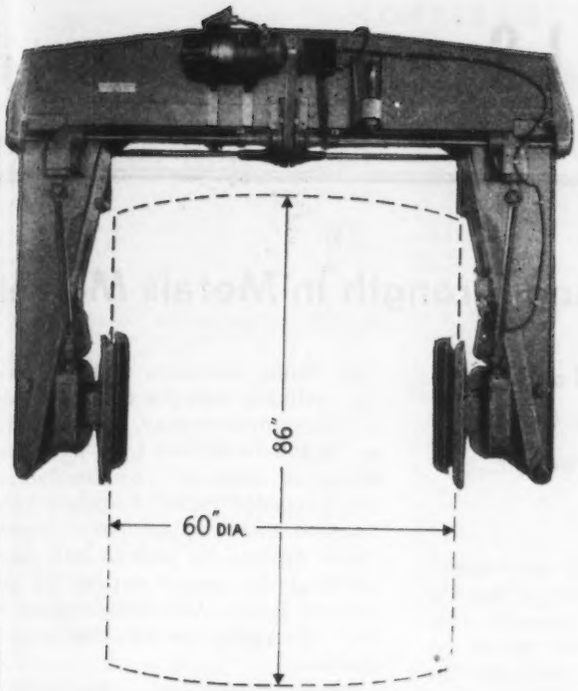
Early this week about 90 sales representatives registered at Western Reserve University here. Earlier this month, a similar number representing eastern machine tool manufacturers, attended a parallel course at Cornell University. The week of Aug. 8-13 another group will be at Dartmouth College, Hanover, N. H. Final course will be at Purdue University, Lafayette, Ind.

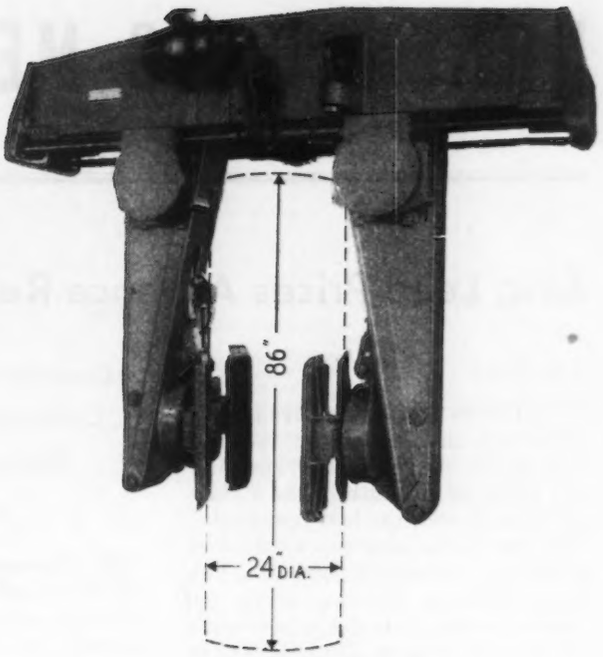
The subject matter ranges from the fundamentals of machine tool selling through market research and product survey, with special attention to tooling-up, work simplification, machine layout, materials handling and engineering economy. It covers engineering types of analysis involved in the selection of machine tool equipment, and the sales procedure to be used in presenting information on the use of specific tools for specific jobs.

The faculty includes in each case members of the regular teaching staff at the universities, and executives from both companies using machine tools and companies building machine tools.

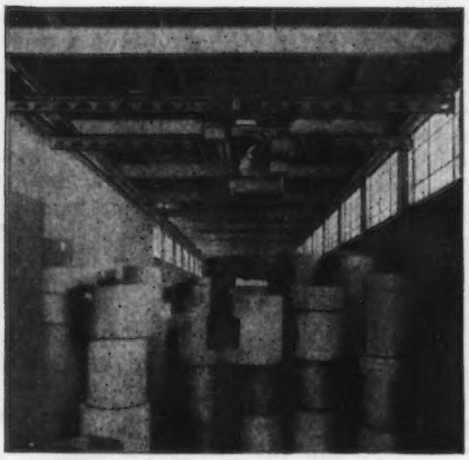
J. C. Hebert, general sales manager, Jones & Lamson Machine Co., Springfield, Vt., is chairman of the NMTBA committee, and L. D. McDonald, vice-president, Warner & Swasey Co., Cleveland, and president of the association, is an ex-officio member.

Four men will represent industry in the Western Reserve presentations. They are Arthur G. Hopcraft, purchasing agent for Cleveland Worm & Gear Co.; Frank Kolb, assistant general sales manager, Cleveland Electric Illuminating Co.; Dr. O. A. Ohmann, assistant to vice-president, Standard Oil Co. (Ohio), and Richard H. Valentine, district manager, New Departure Div., General Motors Corp., Cleveland.





LARGE OR SMALL ROLLS
THIS GRAB HANDLES THEM ALL



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Cleveland Tramrail Systems with motorized roll grab handle all size rolls up to 6000 lbs. Stock of all types from light crepe, tissue and felt, to kraft and hard box-board are held firmly without telescoping. Motorized mechanism turns rolls to horizontal or vertical position.

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NONFERROUS METALS

. . . News and Market Activities

Zinc, Lead Prices Advance Reflecting Strength In Metals Market

New York

• • • **Prices of zinc** and lead were advanced on Monday by ½¢ and ¼¢ per lb, respectively, reflecting the growing strength in the metals markets during the last few weeks. The rise in the zinc price followed a similar increase 7 days ago. The lead increase follows a 1¢ increase on July 8 and ½¢ increases on July 12 and 13. Both advances originated in custom smelting circles and were followed at once by producers.

Buying of lead and zinc continues brisk at the higher prices. The lead market, the first to show a significantly declining rate of demand, has staged a remarkable recovery. July sales will approach 85,000 tons, with nearly 70,000 tons for shipment during the month. These figures may be compared with average monthly sales in 1948 of 56,000 tons and shipments of 57,000 tons. Sales for shipment in June reached 60,000 tons, the best month since January. The low point in 1949 was in April with shipments of 28,000 tons. Battery shipments in June are reported by Dun & Bradstreet at 1,059,000 units compared with 686,000 units in May.

While the demand for lead has been rising rapidly, domestic production has been falling. The May figures of the Bureau of Mines show a 6 pct drop in production. Secondary lead production has shown an even greater drop of about 30 pct in April. Secondary production in that month was 27,923 tons, in comparison with a rate of over 40,000 tons a month a half year ago.

The high rate of current demand for lead is serving to work down the stocks of lead at producers' plants but there are still significant stocks on hand.

Demand for zinc is active from galvanizers and die casters. Brass mills continue to draw largely on scrap for their zinc requirements.

Demand for Lead and Zinc Continues While Copper Shows Improvement

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July shipments of zinc are expected to be well in excess of the 45,000 tons shipped to domestic consumers in June. This figure reflects a 9500 ton increase over the May low point of 35,564 tons, which may be compared with the 1948 monthly average of 64,200 tons.

Although there has been some improvement in the demand for copper the market has not firmed up as significantly as the lead and zinc markets. It is estimated by market observers that July sales to the domestic market may reach 40,000 to 45,000 tons. This might be considered fairly good for a summer month involving fabricator shutdowns for vacations. It is learned that some sales have been made in the export market for future delivery at prices something below the current domestic market. Another indication of the expected price level over the long term can be seen in the action of two important producers in reducing their prices to the going market level, thereby removing the initiative in sales and prices from the custom smelters.

World production of copper has been cut back by the mine closings by an estimated 400,000 to 450,000 tons a year from the 2.2 million tons production in 1948. This is a reduction of slightly less than 25 pct in total world production. Some members of the industry estimate that the domestic rate of consumption may be stabilized at 75,000 to 80,000 tons a month, bringing domestic production at the curtailed rates to approximate balance with requirements. Should these figures be proved out, market stability would depend on the sale of South American copper to the stockpile or to the export market.

There have been no further developments in the negotiations between the union and the U. S. Metals Refining Co. Meanwhile the Carteret, N. J. plant is closed down with a loss of 11,000 tons of copper a month. The refining industry as a whole is watching these negotiations as the outcome is expected to set a pattern for the industry. It has been estimated that the fringe benefits alone demanded by the union would cost 37¢ an hr.

Negotiations have broken down as the result of a basic disagreement on whether the findings of the company's plant engineering survey should be put into effect. The recent decision of the mine, mill and smelter workers to authorize their officials to sign non-communist affidavits may be a factor in the current round of wage demands on producers and fabricators. It could bring to an end the year long strike at two plants of the American Zinc, Lead & Smelting Co.

The scrap market was very quiet last week, the only price developments being to bring the prices of metals into line with recent advances in primary metals.

Nonferrous Metals Prices

	July 20	July 21	July 22	July 23	July 25	July 26
Copper, electro, Conn.	17.625	17.625	17.625	17.625	17.625	17.625
Copper, Lake, Conn.	17.75	17.75	17.75	17.75	17.75	17.75
Tin, Grade A, New York	$1.03	$1.03	$1.03	$1.03	$1.03	$1.03
Zinc, East St. Louis	9.50	9.50	9.50	9.50	10.00	10.00
Lead, St. Louis	13.80	13.80	13.80	13.80	14.05	14.05

Note: Quotations are going prices.

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, 10,000 lb, freight allowed	17.00
Aluminum pig	16.00
Antimony, American, Laredo, Tex.	38.50
Beryllium copper, 3.75-4.25% Be dollars per lb contained Be	$24.50
Beryllium aluminum 5% Be, dollars per lb contained Be	$52.00
Bismuth, ton lots	$2.00
Cadmium, del'd	$2.00
Cobalt, 97-99% (per lb)	$1.80 to $1.87
Copper, electro, Conn. Valley	17.625
Copper, lake, Conn. Valley	17.75
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$100 to $110
Lead, St. Louis	14.05
Lead, New York	14.25
Magnesium, 99.8+%, f.o.b. Freeport, Tex.	20.50
Magnesium, sticks, carlots	34.50
Mercury, dollars per 76-lb flask f.o.b. New York	$82 to $84
Nickel, electro, f.o.b. New York	42.93
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per troy oz.	$69 to $72
Silver, New York, cents per oz.	71.50
Tin, Grade A, New York	$1.03
Zinc, East St. Louis	10.00
Zinc, New York	10.70
Zirconium copper, 10-12 pct Zr, per lb contained Zr	$12.00

Remelted Metals

Brass Ingot

(Published prices, cents per lb delivered, carloads)

85-5-5-5 ingot		
No. 115	13.75*	16.00
No. 120	13.25*	15.50
No. 123	12.75*	15.00
88-10-10 ingot		
No. 305		20.50
No. 315		17.50
98-10-2 ingot		
No. 210		27.00
No. 215		24.00
No. 245	16.50*	19.25
Yellow ingot		
No. 405	11.50*	13.75
Manganese bronze		
No. 421		18.50

*F.o.b. Philadelphia.

Aluminum Ingot

(Cents per lb, lots of 30,000 lb)

95-5 aluminum-silicon alloys	
0.30 copper, max.	18.00-18.50
0.60 copper, max.	17.75-18.25
Piston alloys (No. 122 type)	15.50-15.75
No. 12 alum. (No. 2 grade)	14.50
108 alloy	15.25-15.50
195 alloy	16.00-16.75
13 alloy	18.50
AXS-679	15.50-16.00
95% Al, Ti, Aluminum, f.o.b., Eddystone, Pa.	
No. 1 copper	31.00
2% copper	28.00

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—95-97½%	15.50-15.75
Grade 2—92-95%	14.50-14.75
Grade 3—90-92%	13.50-13.75
Grade 4—85-90%	12.50-12.75

Electroplating Supplies

Anodes

(Cents per lb, freight allowed, in 500 lb lots)

Copper	
Cast, oval, 15 in. or longer	34¾
Electrodeposited	28¾
Rolled, oval, straight, delivered	31.84
Ball anodes	32¾
Brass, 80-20	
Cast, oval, 15 in. or longer	30¾
Zinc, oval, 99.886, f.o.b. Detroit	22½
Ball anodes	20½
Nickel 99 pct plus	
Cast	59.00
Rolled, depolarized	60.00
Cadmium	$2.15
Silver 999 fine, rolled, 100 oz lots, per troy oz, f.o.b. Bridgeport, Conn.	79

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum	48.00
Copper sulfate, 99.5 crystals, bbl.	9.10
Nickel salts, single or double, 4-100 lb bags, frt allowed	18.00
Nickel chloride, 300 lb bbl.	24.50
Silver cyanide, 100 oz lots, per oz.	59
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc sulfate, crystals, 22.5 pct, bags	6.75
Zinc sulfate, 25 pct, flakes, bbl.	7.75

Mill Products

Aluminum

(Base prices, cents per pound, base 30,000 lb, f.o.b. shipping point, freight allowed)

Flat Sheet: 0.188 in., 2S, 3S, 26.9¢; 4S, 61S-O, 28.8¢; 52S, 30.9¢; 24S-O, 24S-OAL, 29.8¢; 75S-O, 75S-OAL, 36.3¢; 0.081 in., 2S, 3S, 27.9¢; 4S, 61S-O, 30.2¢; 52S, 32.3¢; 24S-O, 24S-OAL, 30.9¢; 75S-O, 75S-OAL, 38¢; 0.032 in., 2S, 3S, 29.5¢; 4S, 61S-O, 33.5¢; 52S, 36.2¢; 24S-O, 24S-OAL, 37.9¢; 75S-O, 75S-OAL, 47.6¢.

Plate: ¼ in. and heavier: 2S, 3S, F, 23.8¢; 4S-F, 26¢; 52S-F, 27.1¢; 61S-O, 26.6¢; 24S-F, 24S-FAL, 27.1¢; 75S-F, 75S-FAL, 33.9¢.

Extruded Solid Shapes: Shape factors 1 to 4, 33.6¢ to 64¢; 11 to 13, 34.6¢ to 76¢; 23 to 25, 36.7¢ to $1.05; 35 to 37, 44¢ to $1.53; 47 to 49, 63.5¢ to $2.20.

Rod, Rolled: 1.064 to 4.5 in., 2S-F, 3S-F, 34¢ to 30.5¢; Cold-finished, 0.375 to 3.5 in., 2S, 3S, 36.5¢ to 32¢.

Screw Machine Stock: Drawn, ⅛ to 11/32 in., 11S-T3, R317-T4, 49¢ to 38¢; cold-finished, ⅜ to 1¼ in., 11S-T3, 37.5¢ to 35.5¢; ¾ to 2 in., R317-T4, 37.5¢ to 34.5¢; rolled, 1 9/16 to 3 in., 11S-T3, 35.5¢ to 32.5¢; 2¼ to 3⅜ in., R317-T4, 33.5¢ to 32.5¢. Base 5000 lb.

Drawn Wire: Coiled. 0.051 to 0.374 in.: 2S, 36¢ to 26.5¢; 52S, 44¢ to 32¢; 56S, 47¢ to 38.5¢; 17S-T4, 50¢ to 34.5¢; 61S-T4, 44.5¢ to 34¢; 75S-T6, 76¢ to 55¢.

Magnesium

(Cents per lb, f.o.b. mill, freight allowed Base quantity 30,000 lb)

Sheets and Plate: Ma, FSa, ¼ in., 54¢-56¢; 0.188 in., 56¢-58¢; B & S gage 8, 58¢-60¢; 10, 59¢-61¢; 12, 63¢-65¢; 14, 69¢-74¢; 16, 76¢-81¢; 18, 84¢-89¢; 20, 96¢-$1.01; 22, $1.22-$1.31; 24, $1.62-$1.75. Specification grade higher.

Extruded Round Rod: M, diam in., ¼ to 0.311, 58¢; ½ to ¾, 46¢; 1¼ to 1.749, 43¢; 2¼ to 5, 41¢. Other alloys higher.

Extruded Square, Hex. Bar: M, size across flats. in., ¼ to 0.311, 61¢; ¼ to 0.749, 48¢; 1¼ to 1.749, 44¢; 2½ to 4, 42¢. Other alloys higher.

Extruded Solid Shapes, Rectangle: M, in weight per ft, for perimeters of less than size indicated, 0.10 to 0.11 lb per ft, per. up to 3.5 in., 55¢; 0.22 to 0.25 lb per ft, per. up to 5.9 in., 51¢; 0.50 to 0.59 lb per ft, per. up to 8.6 in., 47¢; 1.8 to 2.59 lb per ft, per. up to 19.5 in., 44¢; 4 to 6 lb per ft, per. up to 28 in., 43¢. Other alloys higher.

Extruded Round Tubing: M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ to 5/16, $1.14; 5/16 to ¾, $1.02; ½ to ⅝, 76¢; 1 to 2 in., 65¢; 0.065 to 0.082, ⅜ to 7/16, 85¢; ⅝ to ¾, 62¢; 1 to 2 in., 57¢; 0.165 to 0.219, ⅝ to ¾, 54.5¢; 1 to 2 in., 53¢; 3 to 4 in., 49¢. Other alloys higher.

Nickel and Monel

(Base prices, cents per lb, f.o.b. mill)

	Nickel	Monel
Sheets, cold rolled	60	47
Strip, cold-rolled	66	50
Rods and shapes		
Hot-rolled	56	45
Cold-drawn	56	45
Angles, hot-rolled	56	45
Plates	58	46
Seamless tubes	89	80
Shot and blocks	..	40

Copper, Brass, Bronze

(Cents per pound, freight prepaid on 200 lb)

	Sheets	Rods	Extruded Shapes
Copper	31.30	....	30.90
Copper, hot-rolled	....	27.15	....
Copper, drawn	....	28.40	
Low brass	29.17	28.96	32.18*
Yellow brass	27.85	27.54	30.86*
Red brass	29.74	29.43	32.65*
Naval brass	33.74	26.80	28.05
Leaded brass	....	22.37	26.41
Commercial bronze	30.74	30.43	33.40*
Manganese bronze	36.24	30.15	31.65
Phosphor bronze	36.24	30.15	31.65
Muntz metal	30.75	26.31	27.56
Everdur, Herculoy, Olympic, etc.	36.19	35.14	....
Nickel silver, 10 pct	38.90	41.11	41.03
Architectural bronze	....	....	26.41

*Seamless tubing.

Scrap Metals

Brass Mill Scrap

(Cents per pound; add ½¢ per lb for shipments of 20,000 to 40,000 lb; add 1¢ for more than 40,000 lb)

	Heavy	Turnings
Copper	14⅝	13⅞
Yellow brass	11⅝	10⅝
Red brass	13⅛	12⅜
Commercial bronze	13⅜	12⅝
Manganese bronze	11¼	10⅜
Leaded brass rod ends	11⅜	....

Custom Smelters' Scrap

(Cents per pound, carload lots, delivered to refinery)

No. 1 copper wire	13.75
No. 2 copper wire	12.75
Light copper	11.75
Refinery brass	11.00 to 11.25*
Radiators	8.50

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound, carload lots, delivered to producer)

No. 1 copper wire	13.75
No. 2 copper wire	12.75
Light copper	11.75
No. 1 composition	10.25
No. 1 comp. turnings	9.75
Rolled brass	8.00 to 8.25
Brass pipe	9.00
Radiators	8.50
Heavy yellow brass	7.25
Aluminum	
Mixed old cast	7.50
Mixed old clips	7.50
Mixed turnings, dry	6.00
Pots and pans	7.50
Low copper	11.00

Dealers' Scrap

(Dealers' buying prices, f.o.b. New York in cents per pound)

Copper and Brass	
No. 1 heavy copper and wire	12 —12¼
No. 2 heavy copper and wire	11 —11¼
Light copper	10 —10¼
Auto radiators (unsweated)	7 — 7¼
No. 1 composition	8¾— 9
No. 1 composition turnings	8¼— 8½
Clean red car boxes	7¼— 7½
Cocks and faucets	7¼— 7½
Mixed heavy yellow brass	6 — 6¼
Old rolled brass	7 — 7¼
Brass pipe	7½— 7¾
New soft brass clippings	10 —10½
Brass rod ends	6½— 7
No. 1 brass rod turnings	5½— 6
Aluminum	
Alum. pistons and struts	3¼— 3½
Aluminum crankcases	5½— 6
2S aluminum clippings	9 — 9½
Old sheet and untensils	5½— 6
Borings and turnings	3
Misc. cast aluminum	5½— 6
Dural clips (24S)	5½— 6
Zinc	
New zinc clippins	5½— 6
Old zinc	3½— 4
Zinc routings	2½— 3
Old die cast scrap	2½
Nickel and Monel	
Pure nickel clippings	16 —17
Clean nickel turnings	14 —15
Nickel anodes	16 —17
Nickel rod ends	16 —17
New Monel clippings	10½—11½
Clean Monel turnings	6 — 7
Old sheet Monel	8 — 9
Old Monel castings	7 — 8
Inconel clippings	10 —11
Nickel silver clippings, mixed	6 — 7
Nickel silver turnings, mixed	5½— 6
Lead	
Soft scrap, lead	9½—10
Battery plates (dry)	6 — 6½
Magnesium Alloys	
Segregated solids	9 —10
Castings	5½— 6½
Miscellaneous	
Block tin	70 —72
No. 1 pewter	47 —49
No. 1 auto babbitt	40 —42
Mixed common babbitt	11 —11½
Solder joints	10½—11
Siphon tops	45 —47
Small foundry type	12¼—12¾
Monotype	11½—12
Lino. and stereotype	11 —11½
Electrotype	9¼—10
New type shell cuttings	10¼—10¾
Hand picked type shells	4
Lino. and stereo. dross	5 — 5½
Electro. dross	3½— 4

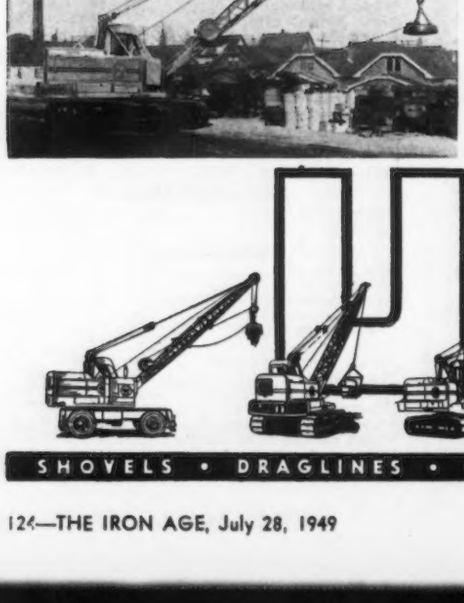
UNIT 1020A

HEAVY-DUTY

The One Machine that Keeps Up with the Baler!

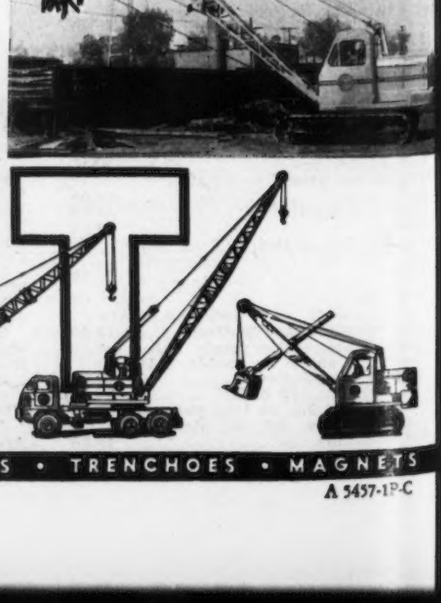
UNIT 1020A . . . Perfectly balanced . . . All-around stability . . . Handles a 45 inch magnet with ease.

The UNIT 1020A is designed and built for heavy-duty scrap yard operation. Extra long crawlers, wider axles and shoes, plus additional counterweight, provide perfect balance and all-around stability. Tipping strains are absorbed by hook-rollers. Owners using 45 inch magnets find them easy to handle. With full loads, there's no weaving or rocking. It has power and stability without bulk . . . fast on the hoist . . . easy on the swing. To modernize your yard — start with a UNIT 1020A.



Quickly convertible to hook, clamshell or magnet, the UNIT 1020A can handle every scrap yard job.

The UNIT 1020A handles heavy steel, baled or loose scrap with day-in and day-out dependability.



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SCRAP

. . . News and Market Activities

Foundry Grades Help To Firm Market

New York

• • • **This week** the market showed a little more strength—especially in the foundry grades. These items have been in demand for the past several weeks in Pittsburgh and Chicago. This trend has spread to other market areas where many foundries have again entered the market and are now doing some buying. There was talk that the steel grades were firm, but marketwise this has not yet been proved. Inventories are still too large for the mills to enter the market and buy large tonnage orders. However, some mills have been buying because they have become low on inventories.

THE IRON AGE scrap composite has remained unchanged since June 28 at $19.33 per gross ton. This is also the low for the year. Prices of No. 1 heavy melting steel this week are: Pittsburgh, $20.50 to $21.00; Chicago, $19.50 to $20.00; and Philadelphia, $17.00 to $18.00.

A definite strengthening of the market has been noted during the past week. Consumers who have been trying to buy below the quoted market prices have not had too much success. In fact, some dealers have put floor prices into effect below which they will not sell. Some brokers have been having trouble filling old commitments at present market prices showing that the market is tending to resist the downward trend.

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CHICAGO—July was supposed to have been a dead month, but the market last week showed considerable activity. Shipments were not heavy and new mill sales were light but behind the scenes trading received a shot in the arm. A flurry for clippings developed which probably presages a strong market in bundles in this district. Turnings aren't as dead as they were and railroad list prices appear to be destined to hold recent advances—and possibly push higher. Foundries that are trying to buy limited amounts of cast are finding the going rough because it just isn't available. Inventories, except at the steel mills, are low. This includes most yards. If the mills come back in the market for good tonnages soon, observers here say prices would bounce $4.00 or $5.00 a ton.

PITTSBURGH—On the basis of a sale of No. 1 heavy melting of unusually large tonnage at $21.00, including a considerable tonnage of No. 1 R.R. heavy melting at the same figure, dropped the latter price $1.00 to a top of $21.00 this week. Shoveling turnings were off 50¢ to $16.00, reflecting a purchase of more than 2500 tons at this figure. Otherwise the market continued dull, and indications were that it will remain quiet at least through August.

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PHILADELPHIA—The market continues all but inactive since only one mill has been buying heavy melting and only in small tonnages. Another mill has been putting out feelers in the heavy melting market and it is expected that an order may be placed this week. One consumer has been negotiating for lower prices for No. 1 and No. 2, but observers believe that scrap cannot be bought at prices lower than those quoted. Some dealers have put into effect floor prices on their inventories below which they will not sell. The market may be said to have firmed up to the extent that dealer sentiment has firmed up. Several consumers are buying turnings in small quantities. Two buyers have bought chemical borings at prices higher than quoted previously, placing this item in the range of $18.00 to $20.00 delivered. There has been a little cast business from one pipe foundry; another has held up shipments until August. Some low phos business was done last week at the quoted market.

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CLEVELAND—A sligthly stronger tone was audible in the scrap market here this week, particularly in the foundry grades. No terrific tonnages have been traded thus far in the flurry but demand is promising and brokers are having difficulties covering their orders. Possibility of a steel strike is apparently keeping openhearth and blast furnace grades at present levels but mills are willing to buy when there is a bargain. The Valley is very weak. Little scrap was produced during July and orders will probably carry over, but if mills or major consumers of foundry grades should come in for tonnage at the same time the market would go up. Machine shop turnings are pretty sick.

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CINCINNATI—Foundry grades were showing a little strength here this week in an otherwise nominal scrap market. Buying was reported to be anticipatory in some cases with foundries figuring apparently that the market is going to go up if a number of consumers should come in simultaneously for tonnage. According to brokers foundry orders are hard to cover at quoted prices although the tonnages involved are relatively small. Yards don't have much scrap and little is coming in except railroad and industrial. Openhearth grades continue weak but blast furnace grades are holding.

DETROIT—In the absence of anything but distress buying, the Detroit scrap market is static. Except for purchases to protect inventory, it is expected that mill buying in this area will be very limited. Plant scrap lists closing this week are expected to reflect the underlying strength or weakness of the market for the first time since the showdown over steel wages was postponed. Reports of large accumulations of scrap on Detroit docks indicate the local market is well supplied with scrap at the moment.

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NEW YORK—Although there was very little activity during the past week, a little more strength was noted in the market. Inventories have been reduced over the past several months and these will finally reach a point where buying will again be necessary to replenish them. Mills have been doing very little buying during the past week. Apparently the foundries expect more business over the coming months since some have again entered the market on a limited scale. One source reported that he was having difficulty covering old orders at the present low prices. The demand has not yet increased to the point where price changes will result. However, there is some encouragement for the future.

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ST. LOUIS—Several steel mills which had been holding off buying pending the outcome of a threatened steel strike offered to make purchases of scrap iron the last week at prevailing prices but brokers were unwilling to sell on that basis, evidencing that the market is strengthening. Foundry grades, too, are showing some strength and brokers believe that the next sales will be at higher prices than now quoted. Receipts have been light and prices are unchanged.

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BOSTON—Large and small consumers alike are not buying scrap. Those that might wish to transact business, hesitate to do so, because of the very low prices. Many of the yards are closed and it appears that there will be no change until late next month. The past week was the dullest ever for cast iron.

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BUFFALO—Market sentiment was improved this week by rebounds from the recent lows in two of the principal steelmaking grades. No. 1 heavy melting sold $1.50 to $2.00 higher in a range of $19.50 to $20.50 and No. 2 steel regained 50¢ to $1.00 at $16.50 to $17.50. Other grades generally failed to follow the leaders and opinion was mixed as to whether the improvement marked the turn that has been forecast by more optimistic members of the trade or merely was the result of buying in a thin market.

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BIRMINGHAM—Despite the unusually high operating rate which mills here have been able to maintain there is no activity in the scrap market. With no competition for local material from out of the district as there is when Northern mills are buying there is enough material here to meet current needs.

Going prices as obtained in the trade by THE IRON AGE, based on representative tonnages.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.50 to $21.00
No. 2 hvy. melting	18.50 to 19.00
No. 1 bundles	20.50 to 21.00
No. 2 bundles	16.50 to 17.00
Machine shop turn.	13.00 to 13.50
Mixed bor. and ms. turn.	13.00 to 13.50
Shoveling turnings	15.50 to 16.00
Cast iron borings	15.50 to 16.00
Low phos. plates	21.00 to 21.50
Heavy turnings	17.50 to 18.00
No. 1 RR. hvy. melting	20.50 to 21.00
Scrap rails, random lgth.	22.00 to 22.50
Rails 2 ft and under	25.50 to 26.00
RR. steel wheels	23.00 to 23.50
RR. spring steel	23.00 to 23.50
RR. couplers and knuckles	23.00 to 23.50
No. 1 machinery cast	26.50 to 27.50
Mixed yard cast.	21.50 to 22.50
Heavy breakable cast.	18.50 to 19.00
Malleable	21.50 to 22.00

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50 to $20.00
No. 2 hvy. melting	17.50 to 18.00
No. 1 factory bundles	19.50 to 20.00
No. 1 dealers' bundles	16.50 to 17.50
No. 2 dealers' bundles	15.50 to 16.00
Machine shop turn.	12.50 to 13.00
Mixed bor. and turn.	9.00 to 10.00
Shoveling turnings	13.00 to 14.00
Cast iron borings	12.00 to 13.00
Low phos. forge crops	24.00 to 24.50
Low phos. plates	22.00 to 23.50
No. 1 RR. hvy. melting	21.50 to 23.50
Scrap rails, random lgth.	23.50 to 24.00
Rerolling rails	29.00 to 30.00
Rails 2 ft and under	27.00 to 28.00
Locomotive tires, cut	26.50 to 27.50
Cut bolsters & side frames	24.00 to 25.00
Angles and splice bars	24.50 to 25.50
RR. steel car axles	27.25 to 29.00
No. 3 steel wheels	23.25 to 23.75
RR. couplers and knuckles	23.00 to 23.50
No. 1 machinery cast.	31.00 to 32.00
No. 1 agricul. cast.	29.00 to 30.00
Heavy breakable cast.	23.50 to 24.00
RR. grate bars	16.00 to 17.00
Cast iron brake shoes	18.00 to 20.00
Cast iron car wheels	28.00 to 29.00
Malleable	24.00 to 25.00

CINCINNATI

Per gross ton, f.o.b. cars:

No. 1 hvy. melting	$16.50 to $17.00
No. 2 hvy. melting	15.00 to 15.50
No. 1 bundles	16.50 to 17.00
No. 2 bundles	13.00 to 14.00
Machine shop turn.	7.00 to 8.00
Mixed bor. and turn.	7.00 to 8.00
Shoveling turnings	7.00 to 8.00
Cast iron borings	8.00 to 9.00
Low phos. 18 in. under	24.00 to 25.00
Rails, random lengths	19.00 to 20.00
Rails, 18 in. and under	29.00 to 30.00
No. 1 cupola cast.	25.00 to 26.00
Hvy. breakable cast.	17.00 to 18.00
Drop broken cast.	29.00 to 30.00

BOSTON

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$9.50 to $10.00
No. 2 hvy. melting	8.50 to 9.50
No. 1 bundles	9.50
No. 2 bundles	8.50
Machine shop turn.	3.50 to 4.00
Mixed bor. and turn.	3.00 to 3.50
Shoveling turnings	6.00 to 6.50
No. 2 busheling	6.50 to 7.00
Clean cast chem. borings	9.00 to 10.00
No. 1 machinery cast	27.00 to 29.00
No. 2 machinery cast	18.00 to 22.00
Heavy breakable cast	16.00 to 17.00
Stove plate	18.00 to 20.00

DETROIT

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$12.50 to $13.00
No. 2 hvy. melting	10.50 to 11.00
No. 1 bundles	12.50 to 13.00
New busheling	12.50 to 13.00
Flashings	12.50 to 13.00
Machine shop turn.	7.00 to 7.50
Mixed bor. and turn.	7.00 to 7.50
Shoveling turnings	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Low phos. plate	12.50 to 13.00
No. 1 cupola cast	22.00 to 23.00
Heavy breakable cast	15.00 to 18.00
Stove plate	16.00 to 17.00
Automotive cast	22.00 to 24.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00 to $18.00
No. 2 hvy. melting	16.00 to 17.00
No. 1 bundles	17.00 to 18.00
No. 2 bundles	15.00 to 16.00
Machine shop turn.	10.50 to 11.50
Mixed bor. and turn.	10.00 to 10.50
Shoveling turnings	12.50 to 13.50
Low phos. punchings, plate	20.00 to 21.00
Low phos. 5 ft and under	19.00 to 20.00
Low phos. bundles	17.00 to 18.00
Hvy. axle forge turn.	17.00 to 18.00
Clean cast chem. borings	18.00 to 20.00
RR. steel wheels	22.00 to 22.50
RR. spring steel	22.00 to 22.50
No. 1 machinery cast	27.00 to 28.00
Mixed yard cast	24.00 to 25.00
Heavy breakable cast	23.00 to 24.00
Cast iron carwheels	27.00 to 28.00
Malleable	23.00 to 24.00

ST. LOUIS

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to $19.00
No. 2 hvy. melting	17.00 to 18.00
No. 2 bundled sheets	15.00 to 16.00
Machine shop turn.	13.00
Shoveling turnings	10.00 to 11.00
Rails, random lengths	21.00 to 22.00
Rails 3 ft and under	25.00 to 26.00
Locomotive tires, uncut	18.00 to 19.00
Angles and splice bars	23.00 to 24.00
Std. steel car axles	21.00 to 22.00
RR. spring steel	21.00 to 22.00
No. 1 machinery cast	23.00 to 25.00
Hvy. breakable cast	19.00 to 20.00
Cast iron brake shoes	19.00 to 20.00
Stove plate	20.00 to 21.00
Cast iron car wheels	24.00 to 25.00
Malleable	19.00 to 20.00

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00
No. 2 hvy. melting	16.00
No. 2 bundles	14.00
No. 1 busheling	16.00
Machine shop turn.	13.00
Shoveling turnings	15.00
Cast iron borings	15.00
Bar crops and plate	22.50
Structural and plate	22.50
No. 1 RR. hvy. melt.	$20.00 to 20.50
Scrap rails, random lgth.	20.00
Rerolling rails	22.50 to 23.00
Rails 2 ft and under	23.00 to 24.00
Angles & splice bars	22.00 to 23.00
Std. steel axles	20.00
No. 1 cupola cast	27.00 to 28.00
Stove plate	20.00
Cast iron carwheels	17.00 to 18.00

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$11.00 to $11.50
No. 2 hvy. melting	10.00 to 10.50
No. 2 bundles	9.00 to 10.00
Machine shop turn.	5.25 to 5.75
Mixed bor. and turn.	4.75 to 5.25
Shoveling turnings	7.00 to 8.00
Clean cast chem. bor.	11.00 to 12.00
No. 1 machinery cast	18.50 to 19.50
Mixed yard cast	17.50 to 18.50
Charging box cast	16.00 to 16.50
Heavy breakable cast	16.00 to 16.50
Unstrp. motor blocks	14.50 to 15.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50 to $20.00
No. 2 hvy. melting	17.00 to 17.50
No. 1 bundles	19.50 to 20.00
No. 2 bundles	15.50 to 16.00
Machine shop turn.	10.00 to 10.50
Shoveling turnings	16.00 to 16.50
Cast iron borings	16.00 to 16.50
Low phos.	20.50 to 21.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50 to $20.50
No. 2 hvy. melting	16.50 to 17.50
No. 1 busheling	16.00 to 16.50
No. 1 bundles	16.50 to 17.50
No. 2 bundles	14.00 to 14.50
Machine shop turn.	10.00 to 10.50
Mixed bor. and turn.	13.50 to 14.00
Shoveling turnings	13.50 to 14.50
Cast iron borings	13.50 to 14.00
Low phos. plate	19.50 to 20.50
Scrap rails, random lgth.	22.00 to 23.00
Rails 3 ft and under	29.00 to 30.00
RR. steel wheels	22.00 to 23.00
RR. spring steel	22.00 to 23.00
RR. couplers and knuckles	22.00 to 23.00
No. 1 cupola cast	21.00 to 22.00
Mixed yard cast	19.00 to 20.00
Stove plate	19.00 to 20.00
Small indus. malleable	17.00 to 18.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to $16.50
No. 2 hvy. melting	14.50 to 15.00
No. 1 busheling	16.00 to 16.50
No. 1 bundles	16.00 to 16.50
No. 2 bundles	13.50 to 14.00
Machine shop turn.	8.50 to 9.00
Mixed bor. and turn.	14.00 to 14.50
Shoveling turnings	14.00 to 14.50
Cast iron borings	14.00 to 14.50
Low phos. 2 ft and under	16.50 to 17.00
Steel axle turn.	16.00 to 16.50
Drop forge flashings	16.00 to 16.50
No. 1 RR. hvy. melting	17.00 to 17.50
Rails 3 ft and under	26.00 to 27.00
Rails 18 in. and under	28.00 to 29.00
No. 1 machinery cast	29.00 to 30.00
RR. cast.	29.00 to 30.00
RR. grate bars	21.00 to 22.00
Stove plate	24.00 to 25.00
Malleable	24.00 to 25.00

SAN FRANCISCO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	18.00
No. 1 bundles	16.00
No. 2 bundles	16.00
No. 3 bundles	13.00
Machine shop turn.	12.00
Elec. fur. 1 ft and under	28.00
No. 1 RR. hvy. melting	20.00
Scrap rails, random lgth.	23.00
No. 1 cupola cast	$20.00 to 25.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	18.00
No. 1 bundles	16.00
No. 2 bundles	16.00
No. 3 bundles	13.00
Mach. shop turn.	12.00
Elec. fur. 1 ft and under	30.00
No. 1 RR. hvy. melting	20.00
No. 1 cupola cast	$24.00 to 26.00

SEATTLE

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00
No. 2 hvy. melting	17.00
No. 1 bundles	16.00
No. 2 bundles	16.00
No. 3 bundles	13.00
Elec. fur. 1 ft and under	22.00
RR. hvy. melting	20.00
No. 1 cupola cast	$20.00 to 27.00
Heavy breakable cast	20.00

HAMILTON, ONT.

Per gross ton delivered to consumer:
Cast grades f.o.b. shipping point:

No. 1 hvy. melting	$21.00
No. 1 bundles	21.00
No. 2 bundles	20.50
Mechanical bundles	19.00
Mixed steel scrap	17.00
Mixed bor. and turn.	15.00
Rails, remelting	21.00
Rails, rerolling	24.00
Bushelings	15.50
Bush., new fact, prep'd	19.00
Bush., new fact, unprep'd.	14.00
Short steel turnings	15.00
Cast scrap	$25.00 to 26.00

Comparison of Prices . .

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Flat-Rolled Steel: (cents per pound)	July 26, 1949	July 19, 1949	June 28, 1949	July 27, 1948
Hot-rolled sheets	3.25	3.25	3.25	3.26
Cold-rolled sheets	4.00	4.00	4.00	4.00
Galvanized sheets (10 ga)	4.40	4.40	4.40	4.40
Hot-rolled strip	3.25	3.25	3.25	3.265
Cold-rolled strip	4.038	4.038	4.038	4.063
Plates	3.40	3.40	3.40	3.42
Plates wrought iron	7.85	7.85	7.85	7.25
Stains C-R strip (No. 302)	33.25	33.25	33.25	30.50
Tin and Terneplate: (dollars per base box)				
Tinplate (1.50 lb) cokes	$7.75	$7.75	$7.75	$6.80
Tinplate, electro (0.50 lb)	6.70	6.70	6.70	6.00
Special coated mfg. ternes	6.65	6.65	6.65	5.90
Bars and Shapes: (cents per pound)				
Merchant bars	3.35	3.35	3.35	3.375
Cold-finished bars	3.995	3.995	3.995	3.994
Alloy bars	3.75	3.75	3.75	3.75
Structural shapes	3.25	3.25	3.25	3.25
Stainless bars (No. 302)	28.50	28.50	28.50	26.00
Wrought iron bars	9.50	9.50	9.50	8.65
Wire: (cents per pound)				
Bright wire	4.15	4.15	4.15	4.256
Rails: (dollars per 100 lb)				
Heavy rails	$3.20	$3.20	$3.20	$3.217
Light rails	3.55	3.55	3.55	3.575
Semifinished Steel: (dollars per net ton)				
Rerolling billets	$52.00	$52.00	$52.00	$52.00
Slabs, rerolling	52.00	52.00	52.00	52.00
Forging billets	61.00	61.00	61.00	61.00
Alloy blooms, billets, slabs	63.00	63.00	63.00	63.00
Wire rod and Skelp: (cents per pound)				
Wire rods	3.40	3.40	3.40	3.619
Skelp	3.25	3.25	3.25	3.25

Pig Iron: (per gross ton)	July 26, 1949	July 19, 1949	June 28, 1949	July 27, 1948
No. 2, foundry, Phila.	$50.56	$50.56	$50.56	$46.76
No. 2, Valley furnace	46.50	46.50	46.50	43.50
No. 2, Southern Cin'ti*	45.47	45.47	45.47	48.14
No. 2, Birmngham	39.38	39.38	39.38	43.38
No. 2, foundry, Chicago†	46.50	46.50	46.50	43.00
Basic del'd Philadelphia*	49.74	49.74	49.74	46.25
Basic, Valley furnace	46.00	46.00	46.00	43.00
Malleable, Chicago†	46.50	46.50	46.50	43.50
Malleable, Valley	46.50	46.50	46.50	43.50
Charcoal, Chicago	73.78	73.78	73.78	69.55
Ferromanganese‡	173.40	173.40	173.40	145.00

†The switching charge for delivery to foundries in the Chicago district is $1 per ton.
‡Average of U. S. prices quoted on Ferroalloy page.
*Does not include interim increase on total freight charges, effective Jan. 11, 1949.

Scrap: (per gross ton)	July 26, 1949	July 19, 1949	June 28, 1949	July 27, 1948
Heavy melt'g steel, P'gh.	$20.75	$20.75	$20.75	$42.75
Heavy melt'g steel, Phila.	17.50	17.50	17.50	45.00
Heavy melt'g steel, Ch'go	19.75	19.75	19.75	41.75
No. 1, hy. comp. sh't Det.	12.75	12.75	13.75	38.00
Low phos. Young'n	20.75	20.75	21.25	47.75
No. 1, cast, Pittsburgh	27.00	27.00	26.50	63.75
No. 1, cast, Philadelphia	27.50	27.50	27.50	65.50
No. 1, cast, Chicago	31.50	31.00	29.50	73.00
Coke: Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.25	$14.25	$14.25	$13.75
Foundry coke, prompt	*15.75*	16.25	16.25	16.50
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro, Conn.	17.625	17.625	16.00	21.50
Copper, Lake Conn.	17.75	17.75	18.625	21.625
Tin, Grade A, New York	$1.03	$1.03	$1.03	$1.03
Zinc, East St. Louis	10.00	9.50	9.00	12.00
Lead, St. Louis	14.05	13.80*	11.85	17.30
Aluminum, virgin	17.00	17.00	17.00	16.00
Nickel, electrolytic	42.93	42.93	42.93	42.93
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	38.50	38.50	38.50	35.00

*Revised

Composite Prices . .

[Starting with the issue of May 12, 1949, the weighted finished steel composite was revised for the years 1941 to date. The weights used are based on the average product shipments for the 7 years 1937 to 1940 inclusive and 1946 to 1948 inclusive. The use of quarterly figures has been eliminated because it was too sensitive, see p. 139 of May 12, 1949, issue.]

	FINISHED STEEL (Base Price)	PIG IRON	SCRAP STEEL
July 26, 1949	3.705¢ per lb.	$45.91 per gross ton	$19.33 per gross ton
One week ago	3.705¢ per lb.	$45.91 per gross ton	$19.33 per gross ton
One month ago	3.705¢ per lb.	$45.91 per gross ton	$19.33 per gross ton
One year ago	3.721¢ per lb.	$43.72 per gross ton	$43.16 per gross ton

	HIGH		LOW		HIGH		LOW		HIGH		LOW	
1949	3.720¢	Jan. 1	3.705¢	May 3	$46.82	Jan. 4	$45.91	May 10	$43.00	Jan. 1	$19.33	June 28
1948	3.721¢	July 27	3.193¢	Jan. 1	46.91	Oct. 12	39.58	Jan. 6	43.16	July 27	39.75	Mar. 9
1947	3.193¢	July 29	2.848¢	Jan. 1	37.98	Dec. 30	30.14	Jan. 7	42.58	Oct. 28	29.50	May 20
1946	2.848¢	Dec. 31	2.464¢	Jan. 1	30.14	Dec. 10	25.37	Jan. 1	31.17	Dec. 24	19.17	Jan. 1
1945	2.464¢	May 29	2.396¢	Jan. 1	25.37	Oct. 23	23.61	Jan. 2	19.17	Jan. 2	18.92	May 22
1944	2.396¢		2.396¢		$23.61		$23.61		19.17	Jan. 11	15.76	Oct. 24
1943	2.396¢		2.396¢		23.61		23.61		$19.17		$19.17	
1942	2.396¢		2.396¢		23.61		23.61		19.17		19.17	
1941	2.396¢		2.396¢		$23.61	Mar. 20	$23.45	Jan. 2	$22.00	Jan. 7	$19.17	Apr. 10
1940	2.30467¢	Jan. 2	2.24107¢	Apr. 16	23.45	Dec. 23	22.61	Jan. 2	21.83	Dec. 30	16.04	Apr. 9
1939	2.35367¢	Jan. 3	2.26689¢	May 16	22.61	Sept. 19	20.61	Sept. 12	22.50	Oct. 3	14.08	May 16
1938	2.58414¢	Jan. 4	2.27207¢	Oct. 18	23.25	June 21	19.61	July 6	15.00	Nov. 22	11.00	June 7
1937	2.58414¢	Mar. 9	2.32263¢	Jan. 4	23.25	Mar. 9	20.25	Feb. 16	21.92	Mar. 30	12.67	June 9
1936	2.32263¢	Dec. 28	2.05200¢	Mar. 10	19.74	Nov. 24	18.73	Aug. 11	17.75	Dec. 21	12.67	June 8
1935	2.07642¢	Oct. 1	2.06492¢	Jan. 8	18.84	Nov. 5	17.83	May 14	13.42	Dec. 10	10.33	Apr. 29
1934	2.15367¢	Apr. 24	1.95757¢	Jan. 2	17.90	May 1	16.90	Jan. 27	13.00	Mar. 13	9.50	Sept. 25
1933	1.95578¢	Oct. 3	1.75836¢	May 2	16.90	Dec. 5	13.56	Jan. 3	12.25	Aug. 8	6.75	Jan. 3
1932	1.89196¢	July 5	1.83901¢	Mar. 1	14.81	Jan. 5	13.56	Dec. 6	8.50	Jan. 12	6.43	July 5
1931	1.99626¢	Jan. 13	1.86586¢	Dec. 29	15.90	Jan. 6	14.79	Dec. 15	11.33	Jan. 6	8.50	Dec. 29
1929	2.31773¢	May 28	2.26498¢	Oct. 29	18.71	May 14	18.21	Dec. 17	17.58	Jan. 29	14.08	Dec. 8

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing major portion of finished steel shipments. Index recapitulated in Aug. 28, 1941, issue and in May 12, 1949.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Iron and Steel Prices . . .

Steel prices shown here are f.o.b. producing points in cents per pound unless otherwise indicated. Extras apply. (1) Widths up to 12-in. inclusive. (2) 0.25 carbon and less. (3) Cokes, 1.25 lb, deduct 25¢ per base box. (4) 18 gage and heavier. (5) For straight length material only from producers to fabricators. (6) Also shafting. For quantities of 40,000 lb and over. (7) Carload lot in manufacturing trade. (8) Hollowware enameling, gages 29 to 31 only. (9) Produced to dimensional tolerances in AISI Manual Sec. 6. (10) Slab prices subject to negotiation in most cases. (11) San Francisco only. (12) Los Angeles only. (13) San Francisco and Los Angeles only. (14) Seattle only. (15) Seattle and Los Angeles only.

PRODUCTS	Base prices at producing points apply to the sizes and grades produced in these areas														
	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio		Detroit	Johnstown	Seattle, S. Frisco, LosAngeles	Fontana
INGOTS Carbon forging	$50.00											$50.00			
Alloy	$51.00						(per net ton)					$51.00			
BILLETS, BLOOMS, SLABS Carbon, rerolling[10]	$52.00				$52.00	$52.00	(per net ton)						$52.00		$71.00
Carbon forging billets	$61.00	$61.00	$61.00	$61.00	$61.00	$61.00	(per net ton)					$61.00	$61.00		$80.00
Alloy	$63.00	$63.00				$63.00	(Bethlehem, Canton, Massillon = $63.00) (per net ton)					$63.00			$82.00
PIPE SKELP	3.25						3.25				Warren = 3.25				
WIRE RODS	3.40	3.40		3.40	3.40		3.40	3.50			Worcester 3.70		3.40	4.05[11] 4.20[12]	
SHEETS Hot-rolled[4]	3.25	3.25	3.25	3.25	3.25	3.25 (Conshohocken, Pa. 3.35)	3.25	3.25		Warren, Ashland = 3.25		3.45		3.95[13]	4.15
Cold-rolled	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.20	4.00	Warren 4.00	4.20		Pittsburg, Cal. 4.95	4.90
Galvanized (10 gage)	4.40	4.40	4.40		4.40			4.40	Canton = 4.40	4.40	Ashland = 4.40			5.15[13]	
Enameling (12 gage)	4.40	4.40	4.40	4.40			4.40		4.60	4.40		4.70			
Long ternes (10 gage)	4.80		4.80							4.80					
STRIP Hot-rolled[1]	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25		3.25	Warren = 3.25	3.45		4.00 to 4.25	4.40
Cold-rolled[2]	4.00	4.15		4.00		4.00	4.00	4.00		New Haven 4.50 Warren = 4.00 to 4.25		4.20 to 4.25			4.90
TINPLATE Coke, 1.50 lb.[3] base box	$7.75	$7.75	$7.75		$7.85			$7.85	$7.95	Warren, Ohio = $7.75				Pittsburg, Cal. = $8.50	
Electrolytic 0.25, 0.50, 0.75 lb. box	Deduct $1.30, $1.05 and 75¢ respectively from 1.50 lb. coke base box price														
TERNES MFG., special coated	Deduct $1.10 from 1.50 lb. coke base box price														
BLACKPLATE CANMAKING 55 to 128 lb.	Deduct $2.00 from 1.50 lb. coke base box price														
BLACKPLATE, h.o., 29 ga.[8]	5.30	5.30	5.30					5.40		Warren, Ohio = 5.30					
BARS Carbon Steel	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35		3.35	Canton = 3.35	3.55	3.35	4.05	4.00
Reinforcing[5]	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35			Canton = 3.35		3.35	4.05 to 4.10	4.00
Cold-finished[6]	3.95 to 4.00	4.00	4.00	4.00		4.00	4.00					4.30			
Alloy, hot-rolled	3.75	3.75	3.75			3.75	3.75	Bethlehem, Canton, Massillon = 3.75				4.05	3.75	4.80[12]	4.75
Alloy cold-drawn	4.65	4.65	4.65	4.65		4.65	4.65	Massillon = 4.65			Worcester 4.95				
PLATE Carbon steel[9]	3.40	3.40	3.40	3.40	3.40 Conshohocken = 3.50	3.40	3.40	3.40 Coatesville = 3.50, Claymont = 3.50 Geneva = 3.40, Harrisburg = 3.50				3.65	3.40	4.30[14]	4.00
Floor plates	4.55	4.55		4.55				Conshohocken, Harrisburg = 4.55							
Alloy	4.40	4.40							Coatesville = 4.50						
SHAPES, Structural	3.25	3.25	3.25		3.25	3.30	Bethlehem = 3.30, Geneva, Utah = 3.25						3.30	3.80 to 3.90[14]	3.80
MANUFACTURERS' WIRE[7] Bright	4.15	4.15		4.15	4.15		4.15	4.25	Duluth = 4.15, Worcester = 4.45				4.15	5.15[11]	
Spring (high carbon)	5.20	5.20		5.20				5.30	Worcester = 5.50 New Haven, Trenton = 5.50				5.20	Duluth = 5.20-6.15	
PILING, Steel sheet	4.05	4.05				4.05									

STAINLESS STEELS

Base prices, in cents per pound, f.o.b. producing point

Product	Chromium Nickel							Straight Chromium		
	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	12.75	13.50	15.00	15.50	22.75	18.25	20.00	11.25	13.75	11.50
Slabs, billets, rerolling	17.00	18.25	20.25	19.25	30.25	24.50	26.75	15.00	18.50	15.25
Forg. discs, die blocks, rings	30.50	30.50	33.00	32.00	49.00	36.50	41.00	24.50	25.00	25.00
Billets, forging	24.25	24.25	26.25	25.50	39.00	29.00	32.75	19.50	20.00	30.00
Bars, wire, structurals	28.50	28.50	31.00	30.00	46.00	34.00	38.50	23.00	23.50	23.50
Plates	32.00	32.00	34.80	34.00	50.50	39.50	44.00	26.00	26.50–27.00	26.50
Sheets	37.50	37.50	39.50	39.50	53.00	45.50	50.00	33.00	33.50	35.50
Strip, hot-rolled	24.25	25.75	30.00	27.75	46.00	34.50	38.75	21.25	28.00	21.75
Strip, cold-rolled	30.50	33.00	36.50	35.00	55.00	44.50	48.50	27.00	33.50	27.50

ELECTRODES

Cents per lb. f.o.b. plant, threaded electrodes with nipples, unboxed

Diameter in in.	Length in in.	
Graphite		
17, 18, 20	60, 72	16.00¢
8 to 16	48, 60, 72	16.50¢
7	48, 60	17.75¢
6	48, 60	19.00¢
4, 5	40	19.50¢
3	40	20.50¢
2½	24, 30	21.00¢
2	24, 30	23.00¢
Carbon		
40	100, 110	7.50¢
35	65, 110	7.50¢
30	65, 84, 110	7.50¢
24	72 to 104	7.50¢
17 to 20	84, 90	7.50¢
14	60, 72	8.00¢
10, 12	60	8.25¢
8	60	8.50¢

TOOL STEEL

F.o.b. mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	—	90.5¢
18	4	1	—	5	$1.42
18	4	2	—	—	$1.025
1.5	4	1.5	8	—	.65¢
6	4	2	6	—	69.5¢

High-carbon-chromium ..... 52¢
Oil hardened manganese ..... 29¢
Special carbon ..... 26.5¢
Extra carbon ..... 22¢
Regular carbon ..... 19¢

Warehouse prices on and east of Mississippi are 2½¢ per lb higher. West of Mississippi, 4½¢ higher.

ELECTRICAL SHEETS

24 gage, HR cut lengths, f.o.b. mill

	Cents per lb
Armature	5.45
Electrical	5.95
Motor	6.70
Dynamo	7.50
Transformer 72	8.05
Transformer 65	8.60
Transformer 58	9.30
Transformer 52	10.10

RAILS, TRACK SUPPLIES

F.o.b. mill

Standard rails, 100 lb and heavier, No. 1 quality, per 100 lb ..... $3.20†
Joint bars, 100 lb 4.25
Light rails per 100 lb 3.55

	Base Price cents per lb
Track spikes	5.35
Axles	5.20
Screw spikes	8.00
Tie plates	4.05
Tie plates, Pittsburg, Calif.*	4.20
Track bolts, untreated	8.25
Track bolts, heat treated, to railroads	8.50

*Seattle, add 30¢.
†CF&I, $3.30.

C-R SPRING STEEL

Base per pound f.o.b. mill

0.26 to 0.40 carbon ..... 4.00¢
0.41 to 0.60 carbon ..... 5.50¢
0.61 to 0.80 carbon ..... 6.10¢
0.81 to 1.05 carbon ..... 8.05¢
1.06 to 1.35 carbon ..... 10.35¢
Worcester, add 0.30¢.

CLAD STEEL

Base prices, cents per pound, f.o.b. mill

	Plate	Sheet
Stainless-carbon		
No. 304, 20 pct, Coatesville, Pa.	*26.50	
Washington, Pa.	*26.50	*22.50
Claymont, Del.	*26.50	
Conshohocken, Pa.		*22.50
Nickel-carbon 10 pct, Coatesville	27.50	
Inconel-carbon 10 pct Coatesville	36.00	
Monel-carbon 10 pct, Coatesville	29.00	
No. 302 Stainless-copper-stainless, Carnegie, Pa.		75.00
Aluminized steel sheets Hot dip, Butler, Pa.		7.75

* Includes annealing and pickling, or sandblasting.

MERCHANT WIRE PRODUCTS

To the dealer, f.o.b. mill

	Base Column	*Pittsburg, Calif.*
Standard & coated nails*	103	123
Galvanized nails*	103	123
Woven wire fence†	109	132
Fence posts, carloads††	112	...
Single loop bale ties	106	130
Galvanized barbed wire**	123	143
Twisted barbless wire	123	...

* Pgh., Chi., Duluth; Worcester, 6 columns higher. † 15½ gage and heavier. ** On 80 rod spools, in carloads. †† Duluth and Joliet.

	Base per 100 lb	*Pittsburg, Calif.*
Annealed fence wire‡	$4.80	$5.75
Annealed, galv. fencing‡	5.25	6.20
Cut nails, carloads‡‡	6.75	...

‡ Add 30¢ at Worcester; 10¢ at Sparrows Pt.
‡‡ Less 20¢ to jobbers.

HIGH STRENGTH, LOW ALLOY STEELS

Mill base prices, cents per pound

Steel	Aldecor	Corten	Double Strength No. 1	Dyn-alloy	HI Steel	Mayari R	Otis-coloy	Yoloy	NAX High Tensile
Producer	Republic	Carnegie-Illinois, Republic Sharon*	Republic	Alan Wood	Inland	Bethlehem	Jones & Laughlin	Youngstown Sheet & Tube	Great Lakes Sharon*
Plates	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.45
Sheets									
Hot-rolled	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	5.15
Cold-rolled	6.05	6.05	6.05	.....	6.05	6.05	6.05	6.05	6.25
Galvanized	.....	6.75	.....	.....	.....	6.75	.....	.....	.....
Strip									
Hot-rolled	4.95	4.95	4.95	.....	4.95	4.95	4.95	4.95	5.15
Cold-rolled	.....	.....	6.05	.....	.....	6.05	6.05	6.05	6.25
Shapes	.....	4.95	.....	.....	4.95	5.05	4.95	4.95	.....
Beams	.....	4.95	.....	.....	.....	.....	.....	.....	.....
Bars									
Hot-rolled	5.10	5.10	5.10	.....	5.10	5.10	5.10	5.10	5.30
Bar shapes	.....	5.10	.....	.....	5.10	5.10	5.10	5.10	.....

* Sheets and strip.

PIPE AND TUBING

Base discounts, f.o.b. mills, Base price, about $200.00 per net ton.

STANDARD, THREADED AND COUPLED

Steel, buttweld*	Black	Galv.
½-in.	43 to 41	26½ to 24½
¾-in.	46 to 44	30½ to 28½
1-in.	48½ to 46½	33½ to 31½
1¼-in.	49 to 47	34 to 32
1½-in.	49½ to 47½	34½ to 32½
2-in.	50 to 48	35 to 33
2½ to 3-in.	50½ to 48½	35½ to 33½
Steel, lapweld		
2-in.	39½	26 to 24
2½ to 3-in.	43½ to 42½	28 to 27
3½ to 6-in.	46½ to 42½	31 to 27
Steel, seamless		
2-in.	38½ to 27	23 to 11½
2½ to 3-in.	41½ to 32½	26 to 17
3½ to 6-in.	43½ to 38½	28 to 23
Wrought Iron, buttweld		
⅛-in.	+20½	+47
¼-in.	+10½	+36
⅜ & ½-in.	+ 4½	+27
¾-in.	— 1½	+23½
1-in.	— 2	+23
Wrought Iron, lapweld		
2-in.	+ 7½	+31
2½ to 3½-in.	+ 5	+26½
4-in.	list	+20½
4½ to 8-in.	+ 2	+22

EXTRA STRONG, PLAIN ENDS

Steel, buttweld		
½-in.	42 to 40	27 to 25
¾-in.	46 to 44	31 to 29
1-in.	48 to 46	34 to 32
1¼-in.	48½ to 46½	34½ to 32½
1½-in.	49 to 47	35 to 33
2-in.	49½ to 47½	35½ to 34½
2½ to 3-in.	50 to 48	36 to 34
Steel, lapweld		
2-in.	39½ to 38½	25 to 24
2½ to 3-in.	44½ to 42½	30 to 28
3½ to 6-in.	48 to 44	33½ to 31½
Steel, seamless		
2-in.	37½ to 32½	23 to 18
2½ to 3-in.	41½ to 36½	27 to 23
3½ to 6-in.	45	30½
Wrought Iron, buttweld		
⅛-in.	+16	+40
¼-in.	+ 9½	+34
1 to 2-in.	— 1½	+23
Wrought Iron, lapweld		
2-in.	+ 4½	+27½
2½ to 4-in.	— 5	+16
4½ to 6-in.	— 1	+20½

For threads only, buttweld, lapweld and seamless pipe, one point higher discount (lower price) applies. For plain ends, buttweld, lapweld and seamless pipe 3-in. and smaller, three points higher discount (lower price) applies, while for lapweld and seamless 3½-in. and larger four points higher discount (lower price) applies. On buttweld and lapweld steel pipe, jobbers are granted a discount of 5 pct.
*Fontana, Calif., deduct 11 points from figures in left columns.

BOILER TUBES

Seamless steel and electric welded commercial boiler tubes and locomotive tubes, minimum wall. Prices per 100 ft at mill in carload lots, cut length 4 to 24 ft inclusive.

OD	Gage	Seamless		Electric	Weld
in.	BWG	H.R.	C.R.	H.R.	C.D.
2	13	$19.18	$22.56	$18.60	$21.89
2½	12	25.79	30.33	25.02	29.41
3	12	28.68	33.76	27.82	32.74
3½	11	35.85	42.20	34.78	40.94
4	10	44.51	52.35	43.17	50.78

CAST IRON WATER PIPE

	Per net ton
6 to 24-in., del'd Chicago	$95.70
6 to 24-in., del'd N. Y.	$92.50 to 97.40
6 to 24-in., Birmingham	82.50
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles, for all rail shipment; rail and water shipment less	109.30

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

BOLTS, NUTS, RIVETS, SET SCREWS

Consumer Prices

(Bolts and nuts f.o.b. mill Pittsburgh, Cleveland, Birmingham or Chicago)

Base discount less case lots

Machine and Carriage Bolts

	Pct Off List
½ in. & smaller x 6 in. & shorter	35
9/16 & ⅝ in. x 6 in. & shorter	37
¾ in. & larger x 6 in. shorter	34
All diam., longer than 6 in.	30
Lag, all diam over 6 in. longer	35
Lag, all diam x 6 in. & shorter	37
Plow bolts	47

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	35
9/16 to 1 in. inclusive	34
1⅛ to 1½ in. inclusive	32
1⅝ in. and larger	27

On above bolts and nuts, excepting plow bolts, additional allowances of 15 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifinished Hexagon Nuts

	USS	SAE
7/16 in. and smaller	..	41
½ in. and smaller	38	..
½ in. through 1 in.	..	39
9/16 in. through 1 in.	37	..
1⅛ in. through 1½ in.	35	37
1⅝ in. and larger	28	..

In full case lots, 15 pct additional discount.

Stove Bolts

Packages, nuts separate	$61.75
In bulk	70.00

Large Rivets

(½ in. and larger)

Base per 100 lb	
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$6.75
F.o.b. Lebanon, Pa.	6.75

Small Rivets

(7/16 in. and smaller)

	Pct off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	48

Cap and Set Screws

(In packages)	Pct Off List
Hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in., SAE 1020, bright	46
¾ to 1 in. x 6 in., SAE (1035), heat treated	35
Milled studs	19
Flat head cap screws, listed sizes	5
Fillister head cap, listed sizes	28

FLUORSPAR

Washed gravel fluorspar, f.o.b. cars, Rosiclare, Ill.

Effective CaF, Content:	Base price per net ton
70% or more	$37.00
60% or less	34.00

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports*)

	Per gross ton
Old range, bessemer	$7.60
Old range, nonbessemer	7.45
Mesabi, bessemer	7.35
Mesabi, nonbessemer	7.20
High phosphorus	7.20

After Dec. 31, 1948, increases or decreases in Upper Lake freight, dock and handling charges and taxes thereon to be for the buyers' account.

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron c.i.f. New York, ocean bags	7.9¢ to 9.0¢
Domestic sponge iron, 98+% Fe, carload lots	9.0¢ to 15.0¢
Electrolytic iron, annealed, 99.5+% Fe	31.5¢ to 39.5¢
Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe	48.5¢
Hydrogen reduced iron, minus 300 mesh, 98+% Fe	63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 microns, 98%, 99.8%+ Fe	90.0¢ to 31.7[illegible]
Aluminum	27.0[illegible]
Antimony	53.7[illegible]
Brass, 10 ton lots	20.50 to 23.50¢
Copper, electrolytic	27.75¢
Copper, reduced	27.62½¢
Cadmium	82.4[illegible]
Chromium, electrolytic, 99% min.	$3.5[illegible]
Lead	13.5[illegible]
Manganese	43.0[illegible]
Molybdenum, 99%	$2.6[illegible]
Nickel, unannealed	66.0[illegible]
Nickel, spherical, minus 30 mesh, unannealed	63.0[illegible]
Silicon	34.0[illegible]
Solder powder	8.5¢ plus metal cost
Stainless steel, 302	75.0[illegible]
Tin	$1.15 to $1.3[illegible]
Tungsten, 99%	$2.3[illegible]
Zinc, 10 ton lots	11.75 to 16.25¢

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$14.00 to $14.50
Foundry, beehive (f.o.b. oven)	
Connellsville, Pa.	$15.50 to $16.00
Foundry, oven coke	
Buffalo, del'd	$22.9[illegible]
Chicago, f.o.b.	20.4[illegible]
Detroit, f.o.b.	19.4[illegible]
New England, del'd	22.7[illegible]
Seaboard, N. J., f.o.b.	22.0[illegible]
Philadelphia, f.o.b.	20.4[illegible]
Swedeland, Pa., f.o.b.	20.4[illegible]
Plainesville, Ohio, f.o.b.	20.9[illegible]
Erie, del'd	$21.50 to 22.5[illegible]
Cleveland, del'd	22.4[illegible]
Cincinnati, del'd	21.5[illegible]
St. Paul, f.o.b.	23.5[illegible]
St. Louis, del'd	20.9[illegible]
Birmingham, del'd	18.6[illegible]

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Carloads, Per 1000
First quality, Pa., Ky., Mo., Ill. (except Salina, Pa., add $5)	$80.00
No. 1 Ohio	74.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	74.00
No. 2 Ohio	66.00
Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50)	11.50

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$80.00
Childs, Pa.	84.00
Hays, Pa.	85.00
Chicago District	89.00
Western, Utah and Calif.	95.00
Super Duty, Hays, Pa., Athens, Tex.	$85.00 to 95.00
Silica cement, net ton, bulk, Eastern (except Hays, Pa.)	$13.75 to 14.00
Silica cement, net ton, bulk, Hays, Pa.	16.00
Silica cement, net ton, bulk, Ensley, Ala.	15.00
Silica cement, net ton, bulk, Chicago District	$14.75 to 15.00
Silica cement, net ton, bulk, Utah and Calif.	21.00

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Chester	$69.00

Magnesite Brick

Standard, Balt. and Chester	$91.00
Chemically bonded, Balt. and Chester	80.00

Grain Magnesite

Std. ⅜-in. grains

Domestic, f.o.b. Balt. and Chester, in bulk, fines removed	$56.00 to 56.50
Domestic, f.o.b. Chewelah, Wash., in bulk with fines	$30.50 to 31.00
in sacks with fines	35.00 to 35.50

Dead Burned Dolomite

F.o.b. producing points in Pennsylvania, West Virginia and Ohio, per net ton, bulk, Midwest, add 10¢: Missouri Valley, add 20¢	$12.25

WAREHOUSE PRICES

Base prices, f.o.b. warehouse, dollars per 100 lb. (Metropolitan area delivery, add 15¢ to base price except Cincinnati and New Orleans (*), add 10¢; New York, add 20¢.)

CITIES	SHEETS			STRIP		PLATES	SHAPES	BARS		ALLOY BARS			
	Hot-Rolled	Cold-Rolled (15 gage)	Galvanized (10 gage)	Hot-Rolled	Cold-Rolled		Standard Structural	Hot-Rolled	Cold-Finished	Hot-Rolled, A 4615 As-rolled	Hot-Rolled, A 4140-50 Ann.	Cold-Drawn, A 4615 As-rolled	Cold-Drawn, A 4140-50 Ann.
Baltimore	5.31	6.21–6.41	6.95–7.11	5.37	....	5.56	5.36	5.42	6.16	....	9.60–10.10	....	....
Birmingham	5.00	....	6.40	5.00	....	5.15	5.00	5.10	6.57	....	....	....	....
Boston	5.55	6.45–6.75	7.11–7.61	5.80–5.95	6.75	5.80	5.42	5.52	6.27	9.67–9.79	10.04–10.07	11.23	11.47
Buffalo	4.85	5.75	7.42–7.57	5.24	7.27	5.35	5.00	4.95	5.40	9.36	9.60	10.65	10.95
Chicago	4.85	5.75	6.95–7.10	4.85	5.55–6.68	5.10	4.90	4.90	5.40	8.90	9.26	10.25	10.55
Cincinnati*	5.16–5.51	5.84–6.29	6.59–6.93	5.28–5.43	....	5.53–5.85	5.33	5.33–5.48	6.08–6.20	9.74	9.99	11.19	11.44
Cleveland	4.85	5.75	6.70	5.03	....	5.21	5.01	5.01	5.45	9.05	9.35	10.40	10.70
Detroit	5.28–5.32	6.07–6.18	7.38–7.58	5.27–5.47	6.27–6.58	5.52–5.57	5.33–5.40	5.33–5.55	6.00–6.10	9.67	9.92	11.11	11.35
Houston	6.70–6.95	....	7.30	6.70	....	6.70	6.20–6.70	6.40–6.65	7.60	10.45	10.40	11.45	11.70
Indianapolis	5.29	6.13	7.44	5.29	7.36	5.54	5.34	5.34	6.14	11.25	11.39	....	....
Los Angeles	6.45	.... 7.90	8.05	6.65	8.35[5]	6.15	5.95	6.10	7.95[14]	10.95[15]	10.90[15]	12.45[15]	12.70[15]
Memphis	5.75–5.80	6.60	7.20	5.80–5.95	6.80	5.95–6.00	5.75	5.75	6.53	....	....	....	....
Milwaukee	5.03	5.93	7.13–7.18	5.03–5.38	6.86	5.28	5.08	5.08	5.63	9.53	9.73	10.98	11.23
New Orleans*	5.95	6.75	....	6.15	....	6.15	5.95	5.95	6.65[6]	....	....	....	....
New York	5.40	6.31	6.85–6.90	5.62	6.76	5.65	5.33	5.57	6.36	9.28	9.58	10.63	10.93
Norfolk	6.00	....	....	6.20	....	6.05	6.05	6.05	7.05	....	....	....	....
Omaha	6.13	....	8.33	6.13	....	6.38	6.18	6.18	6.98	....	....	....	....
Philadelphia	5.05	6.24[13]	6.58	5.40	6.29	5.35	5.10	5.40	5.94	9.05	9.35	10.62	10.87
Pittsburgh	.85	5.75	6.90	5.00	6.00	5.05	4.90	4.90	5.40	8.90	9.20	10.25	10.55
Portland	.50[8]–6.90	8.00	8.80–9.10	6.85[5]	....	6.30[8]	6.35[8]	6.35[8]	8.25[14]	10.50[6]	10.10[6]	....	....
Salt Lake City	7.25[3]	8.20	8.80–9.30	7.65[3]	....	6.10[3]	5.70[3]	6.95[8]	8.30	....	....	....	....
San Francisco	6.15[8]–7.15	7.50[2]	7.90	6.75[8]	8.25[5]	6.30–6.35[8]	5.90[8]	5.90[8]	7.55	10.90[15]	10.85[15]	12.40[15]	12.65[15]
Seattle	6.70[4]–7.10	8.15[2]–8.65	8.80 9.30	6.70[4]	....	6.35[4]	6.30[4]	6.20[4]	8.15[14]	....	10.35[15]	....	13.10[15]
St. Louis	5.22–5.37	6.12–6.27	7.32	5.22	6.68–7.54	5.47	5.27	5.27	5.82	9.27–9.72	9.57–9.97	10.82–11.17	10.92–11.42
St. Paul	5.44	6.19–6.34	7.54–7.64	5.44	6.82	5.64–6.69	5.49	5.49	6.04	9.49	9.79	10.84	11.14

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED:
Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED:
Sheets, 400 to 1499 lb strip, extras on all quantities. Bars 1000 lb and over.

ALLOY BARS:
1000 to 1999 lb.

GALVANIZED SHEETS:
450 to 1499 lb.

EXCEPTIONS:
(1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 9999 lb; (5) 2000 lb and over; (6) 1000 lb and over; (7) 400 to 14,999 lb; (8) 400 lb and over; (9) 500 to 1999 lb; (10) 500 to 999 lb; (11) 400 to 3999 lb; (12) 450 to 3749 lb; (13) 400 to 1999 lb; (14) 1500 lb and over; (15) 1000 to 4999 lb; (16) 4000 lb and over; (17) up to 1999 lb; (18) 1000 to 1499 lb; (19) 1500 to 3499 lb.

PIG IRON PRICES

Dollars per gross ton. Delivered prices represent minimums. Delivered prices do not include 3 pct tax on freight nor the 6 pct increase on total freight charges in the Eastern Zone (5 pct Southern Zone, 4 pct Western Zone), effective Jan. 11, 1949.

PRODUCING POINT PRICES

Producing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	48.00	....	....	....	....
Birmingham	38.88	39.38	....	....	....
Buffalo	46.00	46.50	47.00	....	....
Chicago	46.00	46.50	46.50	47.00	....
Cleveland	46.00	46.50	46.50	47.00	51.00
Duluth	46.00	46.50	46.50	47.00	....
Erie	46.00	46.50	46.50	47.00	....
Everett	....	50.00	50.50	....	....
Granite City	47.90	48.40	48.90	....	....
Ironton, Utah	46.00	46.50	....	....	....
Lone Star, Texas	46.00	46.50†	....	....	....
Neville Island	46.00	46.50	46.50	....	....
Geneva, Utah	46.00	46.50	....	....	....
Sharpsville	46.00	46.50	46.50	47.00	....
Steelton	48.00	48.50	49.00	49.50	54.00
Struthers, Ohio	46.00	....	....	....	....
Swedeland	48.00	48.50	49.00	49.50	....
Toledo	46.00	46.50	46.50	47.00	....
Troy, N. Y.	48.00	48.50	49.00	....	54.00
Youngstown	46.00	46.50	46.50	....	....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Producing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$0.50 Arb.	....	50.00	50.50	....	....
Boston	Steelton	6.27	54.27	54.77	55.27	55.77	60.27
Brooklyn	Steelton	5.48	....	53.98	54.48	54.98	59.48
Cincinnati	Birmingham	6.09	44.97	45.47	....	....	....
Jersey City	Steelton	3.67	....	52.17	52.67	53.17	57.67
Los Angeles	Geneva-Ironton	7.13	53.13	53.63	....	....	....
Mansfield	Cleveland-Toledo	3.03	49.03	49.53	49.53	50.03	54.03
Philadelphia	Bethlehem	2.17	50.17	....	....	....	....
Philadelphia	Swedeland	1.31	49.31	49.81	50.31	50.81	....
Philadelphia	Steelton	2.81	50.81	51.31	51.81	52.31	56.81
San Francisco	Geneva-Ironton	7.13	53.13	53.63	....	....	....
Seattle	Geneva-Ironton	7.13	53.13	53.63	....	....	....
St. Louis	Granite City	0.75 Arb.	48.65	49.15	49.65	....	....
Gulf Ports	Lone Star, Texas	....	50.50	51.00†	....	....	....

† Low Phos., Southern Grade.

Producing point prices are subject to switching charges; silicon differential (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct for foundry iron); phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron (blast furnace) silicon 6.01 to 6.50 pct. C/L per g.t., f.o.b. Jackson, Ohio —$59.50; f.o.b. Buffalo, $60.75. Add $1.00 per ton for each additional 0.50 pct Si up to 17 pct. Add 50¢ per ton for each 050 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

Charcoal pig iron base price for low phosphorus $66.00 per gross ton, f.o.b. Lyle, Tenn. Delivered Chicago, $73.78. High phosphorus charcoal pig iron is not being produced.

Ferromanganese

78-82% Mn, Maximum contract base price, gross ton, lump size.

F.o.b. Birmingham	$174
F.o.b. Niagara Falls, Alloy, W. Va., Welland, Ont.	$172
F.o.b. Johnstown, Pa.	$174
F.o.b. Sheridan, Pa.	$172
F.o.b. Etna, Pa.	$175

$2.00 for each 1% above 82% Mn, penalty, $2.15 for each 1% below 78%.

Briquets—Cents per pound of briquet, delivered, 66% contained Mn.

Carload, bulk	10.45
Ton lots	12.05
Less ton lots	12.95

Spiegeleisen

Contract prices gross ton, lump, f.o.b.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Palmerton, Pa.	$64.00	$65.00
Pgh. or Chicago	65.00	66.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, packed	35.5
Ton lots	37.0

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	28
Ton lots	30
Less ton lots	32

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, delivered.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	25.25	27.10	28.30
0.10% max. C	24.75	26.60	27.80
0.15% max. C	24.25	26.10	27.30
0.30% max. C	23.75	25.60	26.80
0.50% max. C	23.25	25.10	26.30
0.75% max. C, 7.00% max. Si	20.25	22.10	23.30

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C. For 2% max. C, deduct 0.2¢.

Carload bulk	8.95
Ton lots	10.60
Briquet, contract basis carlots, bulk delivered, per lb of briquet	10.30
Ton lots	11.90
Less ton lots	12.80

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, $80.00; $78.50 f.o.b. Niagara Falls; Electric furnace silvery iron is not being produced at Jackson. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, for ton lots packed.

96% Si, 2% Fe	20.70
97% Si, 1% Fe	21.10

Silicon Briquets

Contract price, cents per pound of briquet, bulk, delivered, 40% Si, 1 lb Si briquets.

Carload, bulk	6.30
Ton lots	7.90
Less ton lots	8.80

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump size, bulk, in carloads, delivered.

25% Si	18.50
50% Si	11.30
75% Si	13.50
85% Si	14.65
90-95% Si	16.50

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.55

Ferrochrome

Contract prices, cents per pound, contained Cr, lump size, bulk, in carloads, delivered. (65-72% Cr, 2% max. Si)

0.06% C	28.75
0.10% C	28.25
0.15% C	28.00
0.20% C	27.75
0.50% C	27.50
1.00% C	27.25
2.00% C	27.00
65-69% Cr, 4-9% C	20.50
62-66% Cr, 4-6% C, 6-9% Si	21.35

Briquets — Contract price, cents per pound of briquet, delivered, 60% chromium.

Carload bulk	13.75
Ton lots	15.25
Less ton lots	16.15

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 5¢ for each additional 0.25% N.

S. M. Ferrochrome

Contract price, cents per pound chromium contained, lump size, delivered.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads	21.60
Ton lots	23.75
Less ton lots	25.25

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

Carloads	27.75
Ton lots	30.05
Less ton lots	31.85

Chromium Metal

Contract prices, cents per lb chromium contained packed, delivered, ton lots. 97% min. Cr, 1% max. Fe.

0.20% max. C	1.09
0.50% max. C	1.05
9.00% min. C	1.04

Calcium—Silicon

Contract price per lb of alloy, lump, delivered.

30-33% Ca, 60-65% Si, 3.00% max. Fe.

Carloads	17.90
Ton lots	21.00
Less ton lots	22.50

Calcium—Manganese—Silicon

Contract prices, cents per lb of alloy, lump, delivered.

16-20% Ca, 14-18% Mn, 53-59% Si.

Carloads	19.25
Ton lots	21.55
Less ton lots	22.55

CMSZ

Contract price, cents per pound of alloy, delivered.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

Alloy 5: 50-56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

Ton lots	19.75
Less ton lots	21.00

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. V-5: 38-42% Cr, 17-19% Si, 8-11% Mn.

Ton lots	15.75¢
Less ton lots	17.00¢

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. Si 48 to 52%, Ti 9 to 11% Ca 5 to 7%.

Carload packed	17.00¢
Ton lots to carload packed	18.00¢
Less ton lots	19.50¢

SMZ

Contract price, cents per pound of alloy, delivered. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe, ½ in. x 12 mesh.

Ton lots	17.25
Less ton lots	18.50

Other Ferroalloys

Ferrotungsten, standard, lump or ¼ x down, packed, per pound contained W, 5 ton lots, delivered	$2.35
Ferrovanadium, 35-55%, contract basis, delivered, per pound, contained, V.	
Openhearth	$2.90
Crucible	3.00
High speed steel (Primos)	3.10
Vanadium pentoxide, 88-92% V_2O_5 contract basis, per pound contained V_2O_5	$1.20
Ferrocolumbium, 50-60% contract basis, delivered, per pound contained Cb.	
Ton lots	$2.90
Less ton lots	2.95
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Pa., per pound contained Mo.	$1.10
Calcium molybdate, 45-50%, f.o.b. Langeloth, Pa., per pound contained Mo.	96¢
Molybdenum oxide briquets, f.o.b. Langeloth, Pa.; bags, f.o.b. Wash., Pa., per pound contained Mo.	95¢
Ferrotitanium, 40%, regular grade, 10% C max., f.o.b. Niagara Falls, N. Y., freight allowed east of Mississippi and north of Baltimore, ton lots, per lb contained Ti	$1.28
Ferrotitanium, 25%, low carbon, f.o.b. Niagara Falls, N.Y., freight allowed east of Mississippi and north of Baltimore, ton lots, per lb contained Ti	$1.40
Less ton lots	1.45
Ferrotitanium, 15 to 19%, high carbon, f.o.b. Niagara Falls, N. Y., freight allowed east of Mississippi and north of Baltimore, carloads per net ton	$160.00
Ferrophosphorus, electrolytic, 23-26%, carlots, f.o.b. Siglo, Mt. Pleasant, Tenn., $3 unitage, per gross ton	$65.00
10 tons to less carload	75.00
Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.	
Ton lots	21.00¢
Zirconium, 12-15%, contract basis, lump, delivered, per pound of alloy.	
Carload, bulk	6.60¢
Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Suspension Bridge, N. Y.	
Carload	7.40¢
Ton lots	8.80¢
Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound	
Carload, bulk	11.00¢
Ton lots, packed	11.25¢
Less ton lots	11.75¢

Boron Agents

Contract prices, per lb of alloy, del.

Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D. Ton lot	$1.20
F.o.b. Wash., Pa.; 100 lb and over	
10 to 14% B.	.75
14 to 19% B.	1.20
19% min. B.	1.50
Manganese—Boron 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, delivered.	
Ton lots	$1.67
Less ton lots	1.79
Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, delivered.	
Less ton lots	$1.80
Silcaz, contract basis, delivered	
Ton lots	45.00¢
Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over.	
No. 1	93¢
No. 6	63¢
No. 79	45¢
Bortam, f.o.b. Niagara Falls	
Ton lots, per pound	45¢
Less ton lots, per pound	50¢
Carbortam, f.o.b. Suspension Bridge, N. Y.; freight allowed, Ti 15-18%, B 1.00-1.50%, Si 2.5-3.0%, Al 1.0-2.0%.	
Ton lots, per pound	8.625¢
Borosil, f.o.b. Philo, Ohio, freight allowed, B 3-4%, Si 40-45%, per lb contained B	$6.25

(CONTINUED FROM PAGE 94)

tion of government purchase of metals. It is not, quite frankly, a convincing answer.

MR. STRAUSS' second argument seems even weaker than the first. If a free London market existed for metals, there would be some semblance of a world price. If demand was large in relation to the available supply, the price would rise. How would such a rise endanger supplies of base metals for Britain and make it more dependent on dollar purchases? If the United States was the main buyer, Britain and the sterling area would earn additional dollars; if the large demand originated in nondollar countries, British manufacturers could secure adequate supplies by bidding up the price. Was there ever an occasion, when the free metal market was open, of unemployment being created in a period of rising prices because manufacturers could not secure adequate supplies of raw materials? This argument can be accepted on only one assumption—that the Government is reconciled to the British economy remaining permanently out of equilibrium with other countries. If the decision not to reopen the London Metal Exchange was in fact based on these two principal reasons, then the Ministry of Supply must be convicted of having taken an unimaginative and doctrinaire line, and of ignoring the clear demonstration that bulk purchase of metals has imposed a serious burden on consumers in this country which ill accords with the campaign to increase exports.

As if to lend point to these criticisms of price policy under bulk purchase, the Minister's announcement was followed by the publication of a new schedule of prices for copper, lead and zinc. It has at last been decided, now that a free market is not to be reinstituted, to bring prices in Britain to parity with American metal prices, and to make them conform to movements in the New York market. The Ministry of Supply has thus followed the Raw Cotton Commission into phase two of the development of centralized purchase, by which prices charged to British consumers are equated to world prices, and not to the prices paid by the purchasing organization. The parallel is the more complete, because British metal users will in future have the chance of participating in a type of cover scheme; they will be able to book forward supplies of copper, lead and zinc on payment of a premium as an insurance against a rise in prices. Some facilities, though very limited ones, for hedging against a rise will therefore be available in future. Apparently, there is no need, in Mr. Strauss' view, for hedging facilities against falling prices, on the peculiar ground that "we do not expect manufacturers to gamble with raw commodities." That will be scant consolation for the manufacturer who, for entirely good reasons, has to hold stocks.

HOW far do these changes meet the general criticisms levelled against central purchase? Of all the disadvantages accruing to government trading, two are vital. First, prices tend to lag behind those on the world market, such as it is in base metals. The new intention to keep the two sets of prices in line introduces yet another artificial element, for it can be done, in a falling market at least, only by meeting the Ministry's trading loss out of an Exchequer subsidy. Secondly, prices in a free market, reflect many people's appreciation of present and future needs in supply and demand. If one person's assessment is wrong the consequences need be of little concern. Under government trading, however, decisions are made by a very small group of officials who may be right in their judgments, or wrong.

But the consequences of error may be serious because they affect total supplies of base metals for Britain, and because they may also have repercussions on the rest of the trading world. In metals, there really is no proper world market to look to for guidance. Since the war, American prices for the three main nonferrous metals have been taken as an index to world prices, but the New York market is dominated by a few large custom smelters and by integrated firms interested both in mining and in manufacture; it is far from being a satisfactory commodity market, in the same sense as the London Metal Exchange was. Price movements in New York tend to be rigid; and when supplies are short consumers are quite accustomed to paying premiums above the official quotations.

WELDCO Pickling Crates

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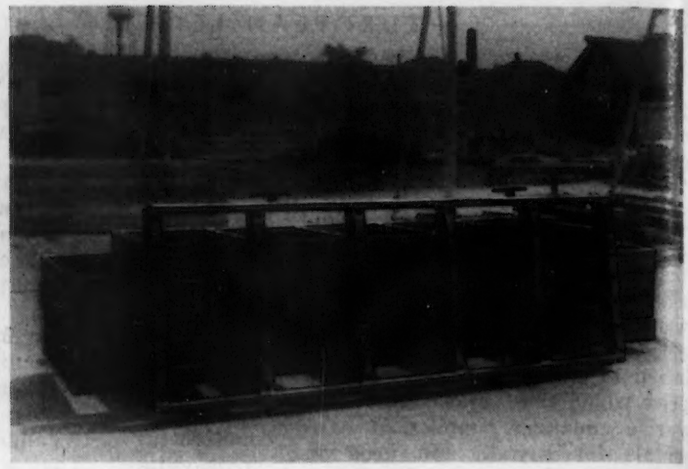

• These six Weldco pickling crates, made of Monel, are now in use in a Gary, Indiana, sheet mill. Sturdy and long-lasting, they're pickling sheet steel in a 5 to 10% sulphuric acid bath at 160° to 180° F. An extra feature of these Monel crates is the new, pierced-type cross member, with these cost-cutting advantages:

1. Greater strength—more tonnage per load.
2. Less hole distortion or enlargement. The taper pins remain tight—do not become loose or wobble.
3. Less time needed for loading, as less time required for placing pins, due to tapered hole.
4. Only a small surface is exposed to attack by acid. Cross member retains its strength longer, and there are fewer replacements.

Why not find out how these long-lasting Weldco crates can improve your pickling operations? Write or phone today for complete details and descriptive literature.

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